Taps & Meters

A Guideline for
Denver Water's System

DENVER WATER
1600 W. 12th Avenue . Denver, CO 80204-3412
Phone 303-628-6000 . Fax 303-628-6199 . www.denverwater.org

Revised 9/2004

Denver Water

Mission Statement

General Information

Denver Water will provide our customers with high quality water and excellent service through responsible and creative stewardship of the assets we manage.

We will do this with a productive and diverse work force.

We will actively participate in and be a responsible member of the water community.

Denver Water is governed by the Board of Water Commissioners, which has complete charge and control of the water works system supplying Denver with water. Denver Water is also empowered under the City Charter to supply water to Distributors outside the territorial limits of the City and County of Denver.

The Denver Board of Water Commissioners can enact rules and standards with respect to any matter within its jurisdiction as defined by the City Charter. When you sign an Application for a Water Supply License, you are agreeing to abide by these rules and standards of Denver Water.

Denver Water's Operating Rules and Engineering Standards are available for public inspection or for sale. Please contact Sales Administration, 303-628-6100, for additional information.

Please note: This handout is subject to change without notification. It is suggested that you contact Denver Water Sales Section at 303-628-6100 to determine if there have been any changes to this publication. – Revised 9/2004

Notes

Useful Telephone Numbers

Denver Water

Backflow Prevention	303-628-5979
Conservation (Water Budget)	303-628-6329
Customer Service (Billing, Area Pressure)	303-893-2444
Customer Service Field Operations	303-628-6841
Engineering Standards (Purchase)	303-628-6633
Hydraulics (Water Pressure & Fire Flow Information)	303-628-5175
Locates (Inside Denver and Total Service Areas)	303-628-6666
Meter Shop (Tap Scheduling)	303-628-6701
Operating Rules (Purchase)	303-628-5110
Plan Review	303-628-6100
Sales Administration	303-628-6100
Tap Sales	303-628-6100
Tap Scheduling	303-628-6701

Denver Water Inspectors

Backflow Prevention	303-628-5979
District 1 (North, Northeast)	
Supervisor:	303-628-6840, 303-994-6793
Inspector:	303-994-6863, 303-994-6809
District 2 (West, Southwest)	
Supervisor:	303-628-6823, 303-994-6819
Inspector:	303-994-6806
District 3 (East, South, Southeast)	
Supervisor:	303-628-6824, 303-994-6861
Inspector:	303-994-6834
Meter Sets (¾" – 1")	303-628-6145
Meter Inspections (1-½" and Larger)	303-628-6701, 303-628-6706
Tee Connection Inspections	303-628-6701, 303-628-6627
AMR Devices	
¾" to 1":	Call District Supervisor
1-1/2" and Larger:	303-628-6701

City and County of Denver and State of Colorado

City of Denver Help Desk	720-865-2700
Denver Wastewater Management (Sewer)	303-446-3500
Denver Plumbing Inspector	720-865-2620
Street Cut Permits	303-446-3469
Wells: State Engineer's Office	303-894-7788

Useful Telephone Numbers (continued)

Special Districts Inside Denver

Denver Suburban	303-779-4550
Grant Ranch	303-674-3379
Green Valley Ranch (GVR) Metropolitan	303-779-4000
Gateway/Sand Creek	303-987-0835

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Denver Water Tap and Meter Checklist

Be sure the contractor or plumber performing service line and meter setting installations has a copy of this booklet. The owner or builder is responsible for assuring compliance with all of the provisions and requirements listed here.

Do not landscape or occupy a property until the meter has been set or inspected and approved

Unauthorized metered or unmetered water use will result in a violation

This checklist provides a summary of the steps you must follow to obtain water service for the first time. For more detailed information, you need to thoroughly review the rest of this booklet.

☐ Call Denver Water's Sales Administration at 303-628-6100 for answers to the following questions:

- Does property front a main?
- Is there already a tap? If yes, what was the usage – commercial, residential or irrigation?
- How much are the fees?
- What paperwork should be submitted?

☐ Get Water Supply License for tap inside Denver from Sales Administration.

☐ Get Water Supply License for tap outside Denver from Water District or Distributor.

☐ Complete and sign all shaded areas on License.

☐ Bring or mail the completed Water Supply License, legal description of property, square foot verification (single family homes) and a check for tap and meter fees to Sales Administration at Denver Water.

☐ Wait for the invoice and pay in Sales Administration, or Denver Water will mail paid receipt.

☐ For meters 1-1/2-inch and larger, contact the meter inspector at 303-628-6706 to arrange an on-site meeting to locate the meter vault before the tap is installed.

☐ If you purchase a 1-1/2-inch or 2-inch meter from Denver Water, present yellow customer copy of paid invoice to Denver Water's Warehouse to pick up the meter. You must have yellow copy of invoice to pick up these items. If you purchase your meter from a supplier other than Denver Water, bring the meter and AMR device to Denver Water's Meter Shop for testing.

☐ Obtain street cut permits from the appropriate jurisdiction.

☐ Call Denver Water Meter Shop at 303-628-6701 at least three full business days before you want your tap made. The more advanced notice you give the better chance you have to schedule a time convenient to you. Scheduling is on a first called, first-served basis.

☐ Purchase tapping materials from a waterworks supply house (Denver Water does not sell or provide tapping materials).

☐ Excavate the street, run the service line to from main to property line and install the curb stop and stop box. Have the trench open and shored as necessary, with the water main exposed, the service line installed and all tapping materials on site when the tapping crew arrives.

☐ After the tapping crew completes the tap, attach the service line to new tap and turn on at corporation stop; tapping crews will not make this connection.

☐ Backfill the trench and patch the street.

☐ If required, install backflow prevention device and submit certification to Denver Water's Backflow Prevention Office.

☐ Install meter pit or inside meter setting to Denver Water specifications. If there will be more than 60 feet of piping between the main and the meter, an outside meter set is required.

☐ If you paid for construction water put a jumper or distance piece in line to use water:

- Only for the address paid for, not for use for other addresses.
- Construction water **cannot** be used for irrigation or at an occupied premise.
- Illegal use of construction water will result in a violation.

3/4-inch and 1-inch Meters only:

☐ Install inside meter setting or set pit according to Denver Water specifications.

☐ Schedule the meter set and AMR device installation by calling the Meter Desk at 303-628-6145 at least two full business days in advance of the day you want the meter set. Indicate if you purchased the meter somewhere other than Denver Water (meter and AMR device should be at Denver Water Meter Shop). It is helpful for someone to be at the property at the time the meter is set.

- The property street address must be posted on the building or the irrigation tap address posted at the meter pit. Lot and block numbers are not sufficient.

- Due to heavy workloads, it may take several days for a field technician to inspect the work. Allow several days for the initial inspection and enough time to make corrections if the work fails inspection.

- Meter pit and stop box must be set to final grade.

- Plastic pan-shaped frost lid and cast iron top lid with recess for AMR device must be in place.

- Plastic meter pits are not approved for use.

- Meter will not be set if the meter setting does not meet Denver Water's specifications. Call the Meter Desk to schedule an inspection. A re-inspection fee will be charged for each repeat visit.

- The field technician will call the contractor's contact with the results of the inspection.

- The water service will be locked off until all deficiencies have been corrected. The field technician will call the contractor's contact if the meter setting fails the inspection.

- When the setting has been brought to standards, call the Meter Desk to schedule a re-inspection. It may take two or more days to schedule a re-inspection. A re-inspection fee will be charged for each repeat visit.

- Verify that the meter was set and the AMR device was installed by checking it in the field or by calling 303-628-6145 the next day if you did not receive a call from the field technician.

Meters Larger than 1-inch:

☐ Construct or set vault or install inside meter setting according to Denver Water specifications.

☐ For 1-1/2-inch and 2-inch meters purchased from Denver Water:

- Pick up from Denver Water's Warehouse

- You **must** present the yellow copy of paid invoice to pick up meter.

☐ For meters purchased from another source:

- Pay the meter test fee in the Sales Administration Office

- Bring the meter and AMR device to Denver Water's Meter Shop to be tested and numbered at least three full working days before it is to be installed.

- After the meter has been tested and numbered, pick it up from the Meter Shop. Denver Water will retain the AMR device for installation at the time of inspection.

- Set the meter to Denver Water specifications. Leave the AMR connector and wire coiled up in a plastic bag on top of the meter. Denver Water will install the AMR device at the time of inspection.

- Call the Meter Shop at 303-628-6706 to schedule an inspection and AMR installation at least three business days in advance. It is helpful for someone to be at the property at the time of inspection.

- Meter settings will not be approved if the setting does not meet Denver Water's specifications, and the service will be locked off until all deficiencies have been corrected.

- When the setting has been brought to standards, call the Meter Shop to schedule a re-inspection. It may take several days before an inspector can make a re-inspection visit. A re-inspection fee will be charged for each repeat visit.

- Verify that the meter and setting have passed inspection by checking it in the field or by calling 303-628-6706 the next day.

- If the meter, pit or vault, setting or service line, are damaged before the building is occupied, the contractor must replace all damaged components prior to occupancy. If the AMR device is damaged, a charge of $175.00 will be assessed to cover the cost of replacement.

How To Obtain A Water Tap And Meter

Step 1. Frontage of the Property to a Water Main

A main must front the property to be served by a minimum of eight feet. If the main has recently been installed, a Construction and Health Release must be on file with Denver Water's Sales Administration Section before your tap can be made. If no main exists, or the main has not been totally released for tapping, the Water Supply License will **not** be processed. You can find out if an acceptable main fronts your property by calling Sales Administration (303-628-6100) with an address and legal description.

Step 2. Legal Description and Service Address

A water tap requires an accurate legal description and numeric service address before a License can be processed. An accurate legal description is very important as the License allows for water use only within that legally described area. A Water Supply License cannot be transferred from one legally described property to another, nor can it be used for purposes other than those addressed under the terms of the License. Licenses for single family residential homes also require the square footage of the gross lot size so the tap fees can be calculated. Fees for multi-family residential taps are based, in part, upon the number of units within the building. Tap fees for commercial properties and irrigation are based on the size of the tap.

A Water Supply License submitted for unplatted parcels must be accompanied by an accurate metes and bounds legal description. A recorded plat (with square footage information), signed by the appropriate county representative, should accompany the License for re-platted or newly platted parcels. Site plans may be required for unplatted parcels, commercial buildings, planned building groups, and irrigation taps.

Irrigation taps for large parcels of land (5-acres or more) may require a special review by the Board of Water Commissioners before a License can be issued. An alternate source of nonpotable recycled water may be required for irrigating these parcels. The Board has the authority to deny the request for service.

An address is required for each License and can be obtained from the Planning Office of the county where the property is located.

Step 3. Existing Water Service

Knowing whether or not water service currently exists to a property could save you time and money, so please determine if a valid tap exists by calling the Sales Administration Section (303-628-6100) before applying for your License. If you are reusing an existing service line for a demolished building, the service line, meter, meter setting and meter pit must be brought into compliance with the current Engineering Standards.

Please see the Mains and Hydrants Section of this booklet for additional information.

Step 4. Applying for the Water Supply License

You may come directly to Denver Water to complete an Application for Water Supply License if the property to be served by the tap is inside the City and County of Denver. If the property lies within a Special District inside Denver, you must notify the District before Denver Water processes your License.

Special Districts Inside the City and County of Denver:

Denver Suburban (DTC area)	303-779-4550
Grant Ranch	303-674-3379
Green Valley Ranch (GVR) Metropolitan	303-779-4000
Sand Creek (Gateway)	303-987-0835

Properties outside Denver require an Application for Water Supply License from the appropriate Distributor. If you are unsure of the Water Distributor, you may notify Sales Administration (303-628-6100) for assistance.

The shaded areas of the Water Supply License must be completed with the following:

- Address of property (including City and Zip Code)
- Legal description of property
- Gross square footage of lot (single family residential properties)
- Size and type of tap (residential, commercial, irrigation, fire protection, etc.)
- Number of units (multi-family, residential and commercial properties)
- Name, mailing address, and signature of the property owner (or agent)
- Name and telephone number of local responsible party
- Distributor's signature (if outside Denver)

The right to take and use water distributed through Denver Water's system exist only by License. Physical connections to any publicly or privately owned facility cannot be made or modified without a Water Supply License.

Step 5. Denver Water Charges

A Water Supply License is not valid and a meter will not be set until full payment of all applicable charges has been made. Because these charges will vary according to tap location, size, type and lot size, please contact Sales Administration for assistance (303-628-6100).

If your tap will be made in a Distributor Contract area outside of the City and County of Denver, the Water Distributor may also assess fees for the water tap. The Distributor can tell you about its fees and procedures, if applicable.

Polyvinylchloride (PVC) mains must be turned off before a tap can be made to them. Valves on any main inside Denver and in Total Service Distributor Contract areas are operated by Denver Water personnel. Many Read and Bill Distributors allow Denver Water personnel to operate valves on PVC mains in their districts. In certain instances, Denver Water may assess a charge for this service when the License is processed. PVC mains in Master Meter Distributor Contract areas will be turned off by the Distributor's personnel.

A Construction Water Charge, paid when the application for a tap is made, covers the cost of water used through the tap for construction purposes before the meter is set. Payment of the construction water charge does **not** allow water use for irrigation or occupancy.

A meter must be set, inspected and approved before irrigation begins or before the structure to be served is occupied.

- **Unauthorized metered or unmetered water use violations will incur fees and penalties**
- **Unauthorized slug removal will incur fees and penalties**
- **Additional trip charge will incur fees**

The License will cancel if a meter has not been set within two (2) years after the application date. Denver Water will turn the water off until the License is renewed.

Step 6. Scheduling the Tap to be Made

After the License has been signed, the appropriate fees paid and the Water Supply License processed by Sales Administration, the tap can be scheduled. Taps 2 inches and smaller are made Monday through Friday during regular business hours (7:00 a.m. – 3:30 p.m.). Special arrangements may be made in exceptional circumstances with the approval of the Meter Shop Foreman for taps scheduled outside regular hours for an additional charge and with at least a week advance notice. Please contact the Meter Shop (303-628-6701) ***at least*** three full business days in advance of the date you want the tap. The limited number of tapping time slots are filled on a first-called first-served bases, call for your appointment as far in advance as possible for the widest choice of appointments.

Before Our Tapping Crew Arrives at the Job Site:

- Obtain necessary street opening permits. A copy of the approved permit must be at the job site for inspection by the tapping crew.

- Safety equipment and procedures that comply with OSHA standards must be used for excavation and traffic control. **Denver Water tapping crews will refuse to make taps if the appropriate safety equipment is not in place and if OSHA standards are not observed. Crews will not enter a trench that appears unstable**.

- In new subdivisions, the front property corners must be clearly marked and property line valves on the street main must be staked or marked.

- The street must be excavated one foot below the bottom of the main to be tapped. ¾-inch and 1-inch taps require an excavation 2-feet wide and 4-feet from the side of the main toward the property line. 1-1/2-inch and 2-inch taps require an excavation 2-feet wide and 6-feet from the side of the main toward the property line. The location of the tap must conform with Denver Water's Engineering Standards and approved plans for the project, if any.

- If necessary, shore the open trench in conformance with OSHA standards, and provide adequate traffic protection around the excavation. The tapping crew will not enter an unsafe excavation. Additional fees will apply if the tap must be re-scheduled for safety considerations.

- The entire circumference of the main to be tapped must be exposed and cleaned.

- All the necessary tapping materials (corporation stop, insulator, tapping saddle) must be provided by the contractor and be at the job site when the tapping crew arrives.

- The tap must be positioned so that the curb stop and meter setting will not be in a sidewalk, driveway or paved area unless previously approved in writing by the Customer Service Field Section. A copy of the written approval or approved plans must be present at the job site to permit the tapping crew to install such a tap.

- The service line (Type "K" soft copper tubing) must be installed from the main to and including the property line valve (curb stop) for inspection. The service line must run at a 90-degree angle from the main to the curb stop with no bends. The service line must be installed to provide no less than 4'6" and no more than 6'0" of cover at the final grade of the street and yard.

Denver Water's Tapping Crew may refuse to make any tap inconsistent with Denver Water's *Engineering Standards* or if any of the tapping materials are not present at the job site when they arrive. If the tap is part of a project, a set of Denver Water approved plans should be on the job site for review by the tapping crew. The tapping crew does not carry tapping materials, nor can they wait while the contractor corrects deficiencies. If tapping must be rescheduled, an extra charge may be assessed. Denver Water will not connect the service line to the corporation stop.

Large taps can be installed as tee connections in conjunction with the fire sprinkler line (fire line) or main installations. New domestic taps cannot be made to existing fire lines. Tee connections include the installation of corporation stops and insulators. All large taps must be installed in conformance with approved plans.

Tee connections may be installed as part of a main extension project or in conjunction with a fire line installation and are done by private contractors. If installed in conjunction with or off of a fire line, the domestic line must run parallel to and no less than five feet from the fire line. A curb stop or property line valve must be placed on the parallel portion of the domestic service pipe, adjacent to and the same distance from the property line as the fire line property valve. The domestic service line must be installed to the property line valve and a curb stop or valve installed prior to Denver Water's inspection and before backfilling. On larger domestic lines, be sure to leave at least three feet clearance between the outside of the fire line pipe and the wall of the meter pit or vault.

Domestic tee connections must be inspected by Denver Water before they are backfilled. Please call 303-628-6627 two to three business days in advance to schedule tee inspections. Please see the Taps and Tee Connections Section and the Mains and Hydrants Section of this booklet for additional information.

Step 7. Backflow Prevention

All commercial, fire sprinkler, and irrigation services installed after January 1, 1997, require the installation of a Denver Water approved backflow prevention assembly or device. Backflow prevention on the domestic service line is required if the premises have an auxiliary source of water, such as a well, ditch, lake or recycled water irrigation system, or if they present a hazard to water quality in the distribution main. A state certified technician must test the backflow preventer when it is installed, and annually after that. The results must be submitted to Denver Water's Backflow Prevention Officer. New water meters will not be set or approved and water service will be discontinued at properties that are non-compliant. Call Denver Water's Backflow Prevention Office at 303-628-5979 for additional information. The backflow preventer must be installed before a distance piece or meter is set or inspected, and before any water is introduced to the premises.

Step 8. Schedule a Meter Set or Inspection

If a meter is not set within two (2) years of the License application, Denver Water will cancel the License. After a License has been canceled, you must reapply for the tap. Denver Water will turn the water off and lock the service line until the License is renewed. A new License and payment of the appropriate fees must be processed before water can be used for construction or before the meter can be set.

If the meter is being installed in an area served by one of our Master Meter Distributors, you must contact the Distributor to arrange for your meter set or inspection. Denver Water does not sell or maintain billing meters or submeters for use in Master Meter Service areas.

The service line and meter setting must be installed in full conformance with the Engineering Standards and the standard details of Denver Water – see the drawings in this booklet, or on line at **www.denverwater.org**.

If the total length of service piping from the water main to the proposed indoor meter setting will exceed 60 feet, the meter **must** be placed in a pit.

The service line may be used to provide construction water **only** if you paid for construction water when applying for the License. Construction water may be used only at the address for which application and payment were made. No water may be used for irrigation or domestic use until the meter and AMR device have been set.

☐ Obtain water meter:

¾-inch and 1-inch meters purchased from Denver Water:

- Meter and AMR device must be paid for in Sales Administration, usually at the time of application for the Water Supply License.
- Denver Water will supply a meter and AMR device at the time of inspection.

¾-inch and 1-inch meters purchased from a supplier other than Denver Water:

- You must purchase a water meter and the proper type of AMR device. Water meters and their registers must be on the list of approved Denver Water meters and must be furnished with an Itron Encoder-Receiver-Transmitter (ERT) that matches the make and model of the meter for the correct installation location (either pit or remote).
- Be sure the meter vendor knows the meter is intended for installation in the Denver Water system. The vendor may call the Denver Water Meter Shop to verify the acceptability of a particular brand and model of meter and register.
- Take the meter and AMR device to the Denver Water Meter Shop for testing and numbering. The meter shop will retain your meter and AMR device until you call for the meter to be set. It usually takes three business days before the meter is ready to be set.

1-1/2-inch and 2-inch meters purchased from Denver Water:

- Meter and AMR device must be paid for in Sales Administration, usually at the time of application for the Water Supply License.

- Pick up your meter from Denver Water's Warehouse. You will need to present the yellow customer copy of the paid receipt to obtain the meter. Keep the meter until you are ready to set it in place.

- Denver Water will retain the AMR device for later installation.

1-1/2-inch and larger meters purchased from a source other than Denver Water:

- You must purchase a water meter and the proper type of AMR device. Water meters and their registers must be on the list of approved Denver Water meters and must be furnished with an Itron Encoder-Receiver-Transmitter (ERT) that matches the make and model of the meter for the correct installation location (either vault or remote).

- Be sure the meter vendor knows the meter is intended for installation in the Denver Water system. The vendor may call the Denver Water Meter Shop to verify the acceptability of a particular brand and model of meter and register.

- Take the meter and AMR device to the Denver Water Meter Shop for testing and numbering. The meter shop will notify you when your meter has been tested. It usually takes three business days before the meter is ready to be picked up.

- The meter shop will retain the AMR device until you call for your meter and setting to be inspected.

For indoor installations, the AMR device may be mounted indoors on or near an outside building wall facing a public street, or it may be mounted on the outside of the building using a double-gang weatherproof electrical box. If the AMR device will be located more than 20 feet away from the meter, you must provide instrumentation cable between the two locations, in conduit if required by local electrical codes. See the Materials Section of this booklet for more information.

☐ Scheduling a Meter Inspection.

Before calling for an inspection, be sure the service line, pit or vault, meter setting, and backflow prevention device (if required) have been properly installed and adjusted to Denver Water's standards.

Meter pit or vault and curb stop box or valve box must be properly adjusted to final grade at the time of inspection. If the curb stop is in a paved area, a standard road box must be installed over the curb box.

If you purchased a small meter from a source other than Denver Water, please do not request an inspection until the meter has been tested at the meter shop.

If there are any deficiencies or deviations from Denver Water's standards which are not approved in advance, the installation will fail the inspection. The water service will be turned off and locked until the deficiencies are corrected. No water may be used at the property for any purpose until the deficiencies are corrected, and the work passes a re-inspection. A re-inspection fee will apply for each inspection after the first.

To save time, be sure all items have been installed to Denver Water standard before calling for an inspection, and that all deficiencies have been corrected before calling for a re-inspection.

All meter inspection slots are filled on a first-come, first served basis. Allow sufficient advance time to schedule the inspection, and to allow for correction of deficiencies and re-inspection. During heavy workload periods it may take several days before an inspection can take place. Avoid requests for inspections within a few days of a pending property sale – a delayed inspection can cause cancellation of the closing.

For ¾-inch and 1-inch meters:

- Call the meter desk at 303-628-6145 at least two full business days before you want the meter set. Provide the representative with a contact name and phone number, and indicate if you have purchased your own meter (which must be available at the meter shop on the day of the inspection).

- A Denver Water Field Technician will inspect the service as soon as possible. The technician will provide results of the inspection by telephone to the contact listed on the inspection order.

- If the work passes the inspection, the field technician will install the meter and the AMR device.

- If the work fails the inspection, the meter and AMR device will not be set; the water service will be turned off and locked until all deficiencies have been corrected.

- When the work has been corrected, call the Meter Desk at 303-628-6145 to schedule a re-inspection. It may take several days before the re-inspection can be completed. A re-inspection fee will be charged for each additional inspection.

For meters larger than 1-inch:

- Pick up your meter from the Warehouse if purchased from Denver Water or from the Meter Shop if purchased from an outside source. Keep the meter until you are ready to install it. Denver Water will retain the AMR device for later installation.

- Call the Meter Shop at 303-628-6706 at least three full business days before you want the inspection. The service line, property line valve and meter vault, meter setting, bypass line, backflow prevention device (if required), AMR device conduit and wiring and mounted equipment (if required), and installed meter must be in full compliance with Denver Water's standards before you call for inspection.

- A Denver Water Field Technician will inspect the service as soon as possible. The technician will provide the results of the inspection by telephone to the contact listed on the inspection order.

- If the work passes the inspection, the field technician will approve the meter installation and will install the AMR device.

- If the work fails the inspection, the technician will leave a checklist describing the deficiencies. The meter will not be approved and the AMR device will not be installed; the water service will be turned off and locked until all deficiencies have been corrected.

- When the work has been corrected, call the Meter Shop at 303-628-6706 to schedule a re-inspection. It may take several days before the re-inspection can be completed. A re-inspection fee will be charged for each additional inspection.

After the meter has been set or approved and the AMR device installed, the billing cycle begins. Questions about water billing should be directed to the Customer Service Office at 303-893-2444.

Step 9. Repair Damages

If the meter, meter pit, curb stop box, or service line are damaged before the building is occupied, the contractor must replace all damaged components and return the entire installation to full compliance with Denver Water standards. If the finished grade is changed, the meter pit or vault and the stop box must be adjusted to grade, and the meter inside the pit must be re-adjusted to standards. If the AMR device is damaged, a charge will be assessed to cover the cost of replacement.

Gated communities must provide access to Denver Water at all times. It is the responsibility of the community's management to provide gate access codes to the Meter Reading Section at 303-628-6837; codes must be updated immediately when they are changed. Failure to do so may result in estimated water bills for all residents of the community.

Refunds

System Development and/or Participation Charges paid for a tap may be refunded (less a processing fee) upon written request to Denver Water's Sales Administration. All refunds must be requested within five (5) years from the date the payment was processed by Denver Water. A refund request for unused materials purchased from Denver Water must be accompanied by the original invoice that was generated when they were purchased, and verification that these materials have been returned to our warehouse. Labor charges are refundable provided the tap has not been made. After a meter has been set, a tap is no longer eligible for a refund.

To receive a refund, either the tap cannot have been made or the tap must have been cut off at the main in the street. The cut-off **must** be witnessed by Denver Water personnel. Sales Administration can provide additional information about refunds (303-628-6100).

Notes

Materials

The following Waterworks Supply Houses are familiar with and can supply materials, including water meters and ERT units that comply with Denver Water's specifications. Some of these products may also be found at other supply sources, including plumbing supply houses.

Dana Kepner Company, Inc.
700 Alcott Street
Denver, Colorado 80204
303-623-6161

National Waterworks
1910 38th Street
Denver, Colorado 80216
303-292-1112

Mountain States Pipe & Supply Co., Inc.
2801 Tower Road
Aurora, Colorado 80011
303-365-0948

Waterworks Sales
4295 Kearney
Denver, Colorado 80216
303-394-0004

Corporation Stops

Corporation stops shall be A.W.W.A. C800 taper to copper and shall be the type outlined below.

Mueller	#H-15000	(Sizes 3/4"	-	2")
Ford	#F-600	(Sizes 3/4"	-	2")
Hays	#5200	(Sizes 3/4"	-	2")
A.Y. McDonald	#4701	(Sizes 3/4"	-	2")
James Jones	#J-1500	(Sizes 3/4"	-	2")
Farnan	#W-100	(Sizes 3/4"	-	2")
Ford	#FB-600	(Sizes 1"	-	2")

Curb Stops

Curb Stops shall be copper to copper and shall be of the type outlined below.

Hays	#4304	(Size 3/4")		
Ford Ball Type	#B-22	(Size 3/4"	-	2")
Mueller	#H-15204	(Sizes 3/4"	-	2")
A.Y. McDonald	#6100	(Sizes 3/4"	-	2")
James Jones Company	#J-1902	(Sizes 3/4"	-	2")
James Jones Company	#J-1901	(Sizes 1-1/2"	-	2")
James Jones Company	#J-1531 with coupling	(Sizes 1-1/2"	-	2")

Meter Yokes

Meter Yokes shall be copper to copper and shall be of the type outlined below.

Ford	#V-80 Series	(Sizes 5/8"	-	1")
Ford	#CH-88-333-9375	(Size 3/4")		
Mueller	#H-14064	(Sizes 3/4"	-	1")
Mueller	#H-1412	(Sizes 3/4"	-	1")
Mueller	#H-1414	Size 3/4")		
A.Y. McDonald	Series 37D	(Sizes 3/4"	-	1")

A.Y. McDonald	22H3-NN22 23	(Size 3/4”)		
Hays	#25542	(Size 3/4”)		
Hays	#25523	(Size 1”)		
James Jones Company	#J04DFCFCAMMC07	(Sizes 5/8”	-	3/4")
James Jones Company	#J04BFCFCAMMC07	(Size 3/4")		
James Jones Company	#J02EF1PF1PAMAMAR-12	(Size 1-1/2")		
James Jones Company	#J02FF1PF1PAMAMAR-12	(Size 2")		

Insulators

Insulators for service lines shall be Ford Service Insulators.

Insulated mechanical couplings shall be Rockwell (Smith-Blair) Style 438 cast insulating coupling or Dresser Style 39 or equal, approved by the Engineer prior to installation.

Stop and Waste Valves

Stop and waste valves shall be brass or bronze and the type outlined below.

Kitz	#47 and 48	(Sizes 3/4"	-	1")
Mueller	#H-15214	(Sizes 3/4"	-	2")
Ford	#Z22-333SW	(3/4")		
Ford	#Z22-444SW	(1")		
Hammond	#667-20	(3/4")		
Hammond	#668-20	(1")		
Red & White	#201	(1")		
Red & White	#200	(3/4")		

Curb Stop Service Boxes

Curb stop service boxes shall be cast iron and shall be of the type outlined below.

Curb Stop boxes for ¾-inch and 1-inch services shall be Tyler 6500 Series, 5-foot extension, size 94E Stop Box Buffalo Type complete, 2-½-inch shaft. D & L Supply Number M-9081 and M-9082 have been approved for curb stop service boxes for ¾-inch and 1-inch services.

Curb stop boxes for 1-½-inch and 2-inch services shall be Tyler 6870 Series, 5-foot extension, Size 145R Stop Box Buffalo Type complete 4-¼-inch shaft.

Tapping Saddles

Double-strapped bronze tapping saddles for use with ductile iron and asbestos-cement pipe shall be:

Ford	#202B	(4”	-	16”)
Superior	Style 36	(4"	-	16")
Mueller	H-16100 Series	(4"	-	12")
Rockwell	#323	(3"	-	20")
James Jones	J-979	(3"	-	16")
APAC	#112	(2"	-	12")
APAC	#113	(14"	-	30")
A.Y. McDonald	#3825	(4”	-	12”)

Bronze Saddles for polyvinyl chloride pipe shall be of the following types:

James Jones	#J-996	(4" - 12")
Mueller	#H-13400 Series for C900	(4" - 12")
Ford	#S-90	(4" - 12")
Clow	#3407, 3408	(4" - 12")
A.Y. McDonald	#3800	(4" - 12")
Powerseal	Model #3401, #3403	(4" - 12")

Residential Meter Pits

Meter pits shall consist of pre-cast concrete rings of any combination totaling 48-inches in height. The rings shall have a 2-inch wall thickness and a 24-inch inside diameter.

Meter Pit Domes and Covers

See MS-23 in Denver Water's *Engineering Standards* for additional information. All iron covers shall have a 2-inch diameter hole and a 7-inch diameter by ¾-inch deep recess to accommodate an ERT, located at least 4-inches from the edge of the cover. Covers from the series listed below with recesses designed to hold an Itron ERT are acceptable. Meter pits furnished with flat lids will be rejected at the time of meter pit inspection

For ¾-inch and 1-inch meter installations in lawns and landscaped areas:

D & L Supply	L-2286, L-2288 or L-2290
Castings, Inc.	M-70-AL, Aluminum Dome with Cast Iron Top Lid M-70-CI Cast Iron Dome (for heavier service)

For ¾-inch and 1-inch meter installations in sidewalks, driveways or light traffic duty: New meter pits are not permitted in sidewalks, driveways and/or parking areas. By special written permission only, a meter pit may be allowed in a traffic area with special requirements for traffic loads, such as the use of traffic-load-bearing pits and domes and installing a remote AMR device outside the traffic area. Contact the Meter Inspector or District Supervisor **before** installing a meter pit in a traffic area. A special cast iron lid with a recess to hold the AMR device may be requested from Denver Water. This lid will be substituted at the time of AMR device installation for the lid supplied by the customer.

For heavy traffic duty: New meter pits are not permitted in roadways, driveways and/or parking areas, except by special written permission which must be obtained **before** setting the pit. The details of the installation will be determined by the Meter Inspector or District Supervisor. Depending on circumstances, the installation may require placement of the AMR device in a remote location with conduit and cable from the pit, installation of a heavy-duty 24-inch diameter manhole cover with a recess to hold the AMR device available from Mountain States Pipe and Supply Company or from East Jordan Iron Works, or other special provisions.

Meter Pit Frost Lids:

All meter pits must be furnished with a plastic interior frost lid. The lid must be pan-shaped, with a two to three-inch deep pan, three to five draining holes ¼-inch in diameter, with a lifting handle and a slot the full depth of the lip that supports the lid to accommodate the AMR device wire.

Service Lines

Seamless copper tube, designated Type "K" (soft) in the industry, shall be used for service lines ¾-inch through 2-inch. Service lines 3-inch and larger must be constructed of ductile iron pipe (see Section 3.11 B of the Engineering Standards for more detail). Service lines must be installed at a 90-degree angle to the water main with no bends before the curb stop/property line valve. For outside meter settings, there can be no bends between the tap and a point five feet on the building side of the meter pit, except in the case of combination services constructed as shown on the standard detail drawings, or when approved in advance by Denver Water. For inside meters, the total length of the service line from the main to the meter setting cannot exceed 60 feet.

See Chapter 11 in the *Engineering Standards* and the Recycled Water Section in this booklet for information about service lines for recycled water irrigation taps.

Automatic Meter Reading Devices

All meters must be furnished with Automatic Meter Reading (AMR) devices manufactured by Itron. AMR devices will be programmed to function with Denver Water's AMR System.

Where the meter and register are installed indoors and not subject to flooding or corrosive environments, the AMR device will be the Itron Remote ERT. The Remote ERT will be provided loose – that is not wired to the water meter register. The meter register will have a 20-foot signal cable meeting Itron's current specifications (see specifications), permanently connected and "potted" (that is, factory sealed) to the register. In special situations, wire lengths up to 150-feet long (250-feet for Badger Meters only) may be permitted with prior approval of the Meter Shop. The customer shall provide conduit-encased instrumentation cable meeting Itron's specifications for any installation in which the wiring run exceeds 20-feet.

Where the meter and register are installed in a pit or vault, or in a location subject to flooding or corrosive environment, the AMR device will usually be the Itron Pit ERT. A signal cable and in-line connector must be pre-wired and "potted" to the meter register with a waterproof connection. Meter sizes ¾-inch and 1-inch will be furnished with 5-feet of cable. Meters 1-1/2-inch and larger will be furnished with 10-feet of cable.

Certain meter installations (such as irrigation systems, meters installed where the pit is subject to traffic loads and some large meter applications) may require special AMR configurations. Please contact the District Supervisor (for ¾-inch and 1-inch services) or the Meter Shop at 303-628-6701 (for larger services) for further information. In certain unusual situations, the Meter Shop may authorize variances from these AMR specifications, but request for such must be made prior to calling for meter installation or inspection.

Meters purchased from sources other than Denver Water will be inspected by the Denver Water's Meter Shop for compliance with this requirement. Any meters furnished without an Itron ERT or with an incorrect meter register or with wiring configurations other than specified will be rejected.

AMR Cable:
Customer or contractor must supply approved signal cable for wiring runs exceeding 10 feet. In most cases, the cable must be installed in ¾-inch or larger conduit. The cable used to connect the water meter to the ERT shall be **Belden #8451**, AWG 22, two-conductor, 7x30 stranded, tinned copper with Aluminum Foil/Polyester tape shielding and black PVC jacket. For Badger Meters with Remote ERT's only, the cable shall be **Belden #9770**, AWG 22, three-conductor (red-black-green or red-black-white), 7x30 stranded, tinned copper with AWG 22 tinned copper drain wire, and brown PVC jacket. Any other brand or model number will require prior approval from the manufacturers of the ERT and the meter, a time-consuming process that will delay the installation of the meter.

For 1-½" and Larger Meters Furnished with ERTs:

The plumber or contractor will bring the meter, pre-wired register and AMR device with appropriate mounting kit to the Denver Water Meter Shop for testing and numbering. When testing is completed, the plumber or contractor will leave the AMR device with the Meter Shop for later installation. When the contractor or plumber installs the meter, he will coil the wire (and in-line connector for pit ERTs) and seal them in a plastic bag left on top of the meter. A Denver Water Field Technician will complete the installation of the AMR device through the hole in the vault cover or on the building wall at the time of meter inspection.

Mains And Hydrants

Denver Water's Sales Administration Section (303-628-6100) can assist you if:

- You are developing a lot that does not have frontage onto a main
- You are installing or relocating a fire hydrant
- You are developing a parcel with no infrastructure in place

If your project involves any of the above, a set of plans must be submitted to Denver Water and the appropriate fees paid for their review. If your property is within one of Denver Water's Distributor Contract areas, the Distributor may want to review your plans before they are submitted to Denver Water. Please contact the Water Distributor in the area where you will be working and ask about their review procedure.

Denver Water requires the submittal of one set of water plans and an Auto Cad diskette of the plans for the first submittal. These plans must include the required fire flows and the fire chief's statement and signature. The appropriate filing fees are due and payable to Denver Water when the plans are submitted.

Three-inch or larger domestic taps or connections for fire sprinklers are often installed as part of a water main installation. If this is the case in your project, a Water Supply License for the fire line and a Stub-In Agreement for the domestic tap must be processed by Sales Administration and the tap numbers assigned for each connection must be included on your plans when they are reviewed. Please contact Sales Administration at 303-628-6100 for information.

Your water line contractor must be pre-qualified with Denver Water to install water mains or hydrants within the City and County of Denver or in a Denver Water Total Service Contract area. The water line contractor for each job must provide the following:

- $5,000 Maintenance Bond (site specific per job)
- Certificate of Insurance (Denver Water must be named as additionally insured on Certificate)
- Proof of Worker's Compensation

For additional information call Sales Administration at 303-628-6100.

When your water plans have been approved, the pre-qualified water contractor must contact Denver Water's Engineering Section at 303-628-6627 48-hours before the start of construction to schedule a pre-construction meeting.

Denver Water will inspect your project during and after construction. When the various inspections and approvals are complete, Denver Water's Engineering Section will release the water mains for tapping. Call Sales Administration at 303-628-6100 with the project name or ID number to see if the main is released.

After the mains have been released, Denver Water can begin processing applications for taps that were not made as part of the main installation. Please contact Sales Administration at 303-628-6100 and reference other sections of this booklet for additional information about new taps.

Notes

Backflow Prevention

303-628-5979

The Federal Safe Drinking Water Act requires backflow prevention devices on all irrigation, fire line and commercial services. In order to fulfill these obligations, Denver Water has, with the approval of the Colorado State Health Department, developed a two-level approach:

I. Existing customers

Based upon the priority of the hazard, Denver Water will notify customers (by mail) of the need to retrofit backflow preventers and the required schedule.

II. New Customers

All new services installed after January 1, 1997, must meet the requirements before service begins.

Noncompliance with this regulation will result in the termination of water service.

Denver Water will notify property owners by mail if a backflow preventer is required on an existing service.

The device you install must be one approved by the Foundation for Cross-Connection Control and Hydraulic Research of the University of California. These devices and assemblies are the **only** ones approved for use within Denver Water's System.

- Installation of backflow prevention assemblies on systems involving fire pumps shall have a low suction pressure shutdown provided with a minimum operation pressure of 10 psi.

- A pressure reducing valve (PRV) or a surge device may be required by Uniform Plumbing Code, Section 6082.

- When retrofitting an existing fire protection system, prior to installing a backflow prevention device, the design and the installation should be reviewed and approved by a Colorado State Registered Professional Engineer experienced in fire protection.

- This review should involve an analysis of the existing fire protection system to ensure that the addition of the backflow prevention device will not adversely affect the fire protection system's performance. Remember, Denver Water does not guarantee the current level of pressure or that the pressure may not be changed in the future!!

- When retrofitting an existing fire protection system, work shall be performed by a contractor registered with the State of Colorado and, where applicable, the local fire protection authority.

- In all cases, Denver Water is the final approval authority for installation of all backflow prevention devices.

A Backflow Device Technician, certified with the State of Colorado's Department of Public Health and Environment, must test the backflow preventer when it is installed, and inspect it annually thereafter. The initial test should be performed before water is used through the service line.
The test results will be forwarded to Denver Water and a copy given to the property owner. Denver Water will verify that the device has been installed and tested after the meter has been set for commercial and irrigation services and before billing begins for fire protection services.

The following are a list of Denver Water approved backflow prevention devices. Contact Denver Water's Backflow Prevention Officer at 303-628-5979, or write to them for a list of State Certified Testers.

Denver Water
Water Quality Section
Backflow Prevention Office
1600 West 12th Avenue
Denver, CO 80204

Backflow Prevention Devices

Reduced Pressure Zone Size Make Model	Vertical Up	Down	Horiz
3/4" Ames 4000B	☐	☐	☑
3/4" Buckner 24000	☐	☐	☑
3/4" Buckner 24000/25	☐	☐	☑
3/4" Cla-Val RP-2	☐	☐	☑
3/4" Conbraco 40-204-02	☐	☐	☑
3/4" Conbraco 40-204-A2	☐	☐	☑
3/4" Conbraco 40-204-A2S	☐	☐	☑
3/4" Conbraco 40-204-A2U	☑	☑	☑
3/4" Conbraco 40-204-A2Z	☑	☐	☑
3/4" Conbraco 4020499T	☐	☐	☑
3/4" Conbraco 40204TCU	☐	☐	☑
3/4" Conbraco 4020TC2	☐	☐	☑
3/4" Febco 825Y	☐	☐	☑
3/4" Febco 825YA	☐	☐	☑
3/4" Febco 825YAR	☐	☐	☑
3/4" Febco 825YR	☐	☐	☑
3/4" Febco 835B	☐	☐	☑
3/4" Febco 845	☐	☐	☑
3/4" Febco 860	☐	☐	☑
3/4" Febco 860U	☐	☐	☑
3/4" Flomatic RPZ	☐	☐	☑
3/4" Flomatic RPZ-II	☐	☐	☑
3/4" Hersey/Grinnell FRP-2	☐	☐	☑
3/4" Orion BRP	☐	☐	☑
3/4" Rain Bird RP-QT-075	☐	☐	☑
3/4" Rain Bird RPA-075-R	☐	☐	☑
3/4" Watts 009M2QT	☐	☐	☑
3/4" Watts 009PCQT	☐	☐	☑
3/4" Watts 009QT	☐	☑	☑
3/4" Watts 009SSPCQT	☐	☐	☑
3/4" Watts 009SSQT	☐	☐	☑
3/4" Watts 909	☑	☑	☑
3/4" Watts 909HWQT	☐	☐	☑
3/4" Watts 909PCHWQT	☐	☐	☑
3/4" Watts 909PCQT	☐	☐	☑

Reduced Pressure Zone Size Make Model	Vertical Up	Down	Horiz
3/4" Watts 909QT	☑	☐	☑
3/4" Watts U009APCQT	☐	☐	☑
3/4" Watts U009AQT	☐	☐	☑
3/4" Watts U009M2QT	☐	☐	☑
3/4" Watts U009QT	☐	☐	☑
3/4" Watts U009SSQT	☐	☐	☑
3/4" Watts U909HWQT	☐	☐	☑
3/4" Watts U909QT	☑	☐	☑
3/4" Wilkins 575	☐	☐	☑
3/4" Wilkins 575A	☐	☐	☑
3/4" Wilkins 975	☐	☐	☑
3/4" Wilkins 975A	☐	☐	☑
3/4" Wilkins 975XL	☐	☐	☑
3/4" Wilkins 975XLBMS	☐	☐	☑
3/4" Wilkins 975XLU	☐	☐	☑
3/4" Wilkins 975XLV	☐	☐	☑

TESTABLE DOUBLE CHECK VALVE
3/4" FEBCO 805Y
3/4" FEBCO 850
3/4" FEBCO 850F
3/4" WATTS 807M1QT
3/4" WATTS 007M2QT
3/4" WATTS 775QT
3/4" WILKINS 950XLT

Backflow Prevention Devices

Reduced Pressure Zone	Vertical		
Size Make Model	Up	Down	Horiz
1" Ames 4000B	☐	☐	☑
1" Ames 4000BM2	☐	☐	☑
1" Ames 4000SS	☐	☐	☑
1" Buckner 24001	☐	☐	☑
1" Buckner 24001/25	☐	☐	☑
1" Cla-Val RP-2	☐	☐	☑
1" Conbraco 40-205-02	☐	☐	☑
1" Conbraco 40-205-A2	☐	☐	☑
1" Conbraco 40-205-A2S	☐	☐	☑
1" Conbraco 40-205-A2U	☑	☑	☑
1" Conbraco 40-205-A2Z	☐	☐	☑
1" Conbraco 4020599T	☐	☐	☑
1" Conbraco 40205TCU	☐	☐	☑
1" Febco 825Y	☐	☐	☑
1" Febco 825YA	☐	☐	☑
1" Febco 825YAR	☐	☐	☑
1" Febco 825YD	☐	☐	☑
1" Febco 825YR	☐	☐	☑
1" Febco 835B	☐	☐	☑
1" Febco 845	☐	☐	☑
1" Febco 860	☐	☐	☑
1" Febco 860U	☐	☐	☑
1" Hersey/Grinnell FRP-2	☐	☐	☑
1" Orion BRP	☐	☐	☑
1" Rain Bird RP-QT-100	☐	☐	☑
1" Rain Bird RPA-100-R	☐	☐	☑
1" Watts 009M2PCQT	☐	☐	☑
1" Watts 009M2PCQT	☐	☐	☑
1" Watts 009M2QT	☐	☐	☑
1" Watts 009PCQT	☐	☐	☑
1" Watts 009QT	☐	☑	☑
1" Watts 009SSPCQT	☐	☐	☑
1" Watts 009SSQT	☐	☐	☑
1" Watts 909	☑	☑	☑
1" Watts 909HWQT	☐	☐	☑

Reduced Pressure Zone	Vertical		
Size Make Model	Up	Down	Horiz
1" Watts 909PCHWQT	☐	☐	☑
1" Watts 909PCHWQT	☐	☐	☑
1" Watts 909PCQT	☑	☐	☑
1" Watts 909QT	☑	☐	☑
1" Watts SS009QT	☐	☐	☑
1" Watts U009APCQT	☐	☐	☑
1" Watts U009AQT	☐	☐	☑
1" Watts U009M2APCQT	☐	☐	☑
1" Watts U009M2APCQT	☐	☐	☑
1" Watts U009M2AQT	☐	☐	☑
1" Watts U009M2AQT	☐	☐	☑
1" Watts U009M2PCQT	☐	☐	☑
1" Watts U009M2QT	☐	☐	☑
1" Watts U009M2QT	☐	☐	☑
1" Watts U009QT	☐	☐	☑
1" Watts U009SSQT	☐	☐	☑
1" Watts U909HWQT	☐	☐	☑
1" Watts U909QT	☐	☐	☑
1" Watts U909QT	☑	☐	☑
1" Watts U909QT	☑	☐	☑
1" Watts U998M2PCQT	☐	☐	☑
1" Wilkins 575	☐	☐	☑
1" Wilkins 575A	☐	☐	☑
1" Wilkins 975	☐	☐	☑
1" Wilkins 975A	☐	☐	☑
1" Wilkins 975XL	☐	☐	☑
1" Wilkins 975XLBMS	☐	☐	☑
1" Wilkins 975XLU	☐	☐	☑
1" Wilkins 975XLV	☐	☐	☑

TESTABLE DOUBLE CHECK VALVE
1" FEBCO 805Y
1" FEBCO 850
1" FEBCO 850F
1" WATTS 807M1QT
1" WATTS 007M2QT
1" WATTS 775QT
1" WILKINS 950XLT

Taps And Tee Connections

Whether a connection to a main will be a direct tap or a tee connection depends upon the size of the connection and the size and type of the main that will be tapped. **Tapping saddles are always required for all taps.**

All PVC water mains must be turned off and relieved of pressure before they can be tapped. If you request a tap on a PVC main, either Denver Water personnel or a crew from the appropriate Water District must turn off the main. Call Sales Administration (303-628-6100) to determine if the main is PVC and who will turn it off.

Tee connections require a corporation stop and insulator except for a 3-inch domestic on a 4-inch fire line.

All taps 3-inch and larger are tee connections.

24-inch and larger mains are transmission mains and cannot be tapped.

The table below details main and tap sizes, and the kind of connection that Denver Water requires for each. All taps, ¾-inch to 2-inch made on asbestos cement (CA) or PVC mains require saddles. Taps made to steel mains require special materials and a different procedure. Please contact Sales Administration (303-628-6100) for additional information and costs.

Main Size	**Tap Size**			
	3/4-inch	**1-inch**	**1-1/2 inch**	**2-inch**
4	Saddle	Saddle	Tee	Tee
6	Saddle	Saddle	Saddle	Saddle
8	Saddle	Saddle	Saddle	Saddle
12	Saddle	Saddle	Saddle	Saddle
16	Saddle	Saddle	Saddle	Saddle
18	Saddle	Saddle	Saddle	Saddle
20	Saddle	Saddle	Saddle	Saddle

All tee connections must be inspected before they are backfilled.

Please call Engineering at 303-628-6627 for tee connection inspections.

See the Backflow Prevention Section in this booklet and call the Backflow Prevention Office at 303-628-5979 for backflow prevention information.

See the Section on mains and hydrants in this booklet for additional information about tee connections.

3-inch And Larger Fire Line And Domestic Taps

Both large domestic and fire line taps to be made on existing mains require a signed, completed, and processed Water Supply License, an Actual Cost Letter and the estimated cost for the project paid before the tap can be made or inspected. Large domestic taps and fire lines are frequently installed by private contractors in conjunction with water main extension projects. A Water Supply License for the fire line and a Stub-in Agreement for the domestic tee connection must be processed, and the tap numbers included on the water plans before the plans are reviewed. These tee connections are inspected and approved by Denver Water after the water mains have been installed. Sales Administration (303-628-6100) can provide information about tee connections made with main extension projects or about the installation of fire hydrants. See the Mains and Hydrants Section and the Taps and Tee Connections Section of this booklet for additional information.

All tee connections must always be inspected by Denver Water before they are backfilled. Please call 303-628-6627 two to three days in advance to schedule an inspection.

The cost to install 3-inch and larger taps on existing water mains within the City and County of Denver and in Total Service Distributor Contract areas is estimated by Denver Water. Unless these taps are installed as part of a main extension project, Denver Water will install them after an Actual Cost Letter has been signed and the estimated cost for the project has been paid.

In Read and Bill and Master Meter Distributor Contract areas, a private contractor installs and Denver Water inspects 3-inch and larger taps. A fee will be assessed for this inspection.

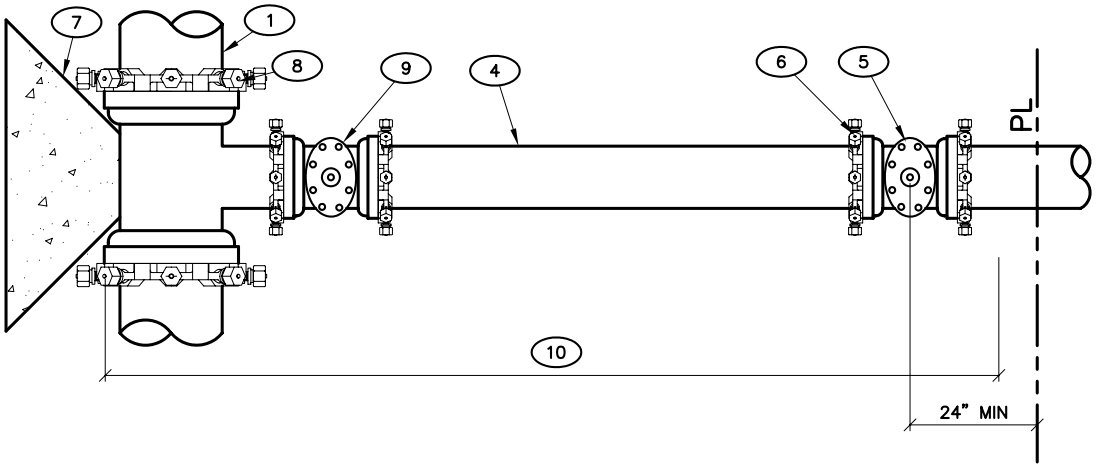
Fire line taps provide structures with water for overhead sprinklers, and are processed in the Sales Administration Section. Fire hydrant connections do not require a Water Supply License. No connections can be made to the branch line between the main and the hydrant. Please contact Sales Administration (303-628-6100) for information about installing or relocating fire hydrants.

Please call Sales Administration (303-628-6100) for information about having an estimate prepared for a 3-inch or larger tap, or about the cost and procedure for our crews to inspect a large connection.

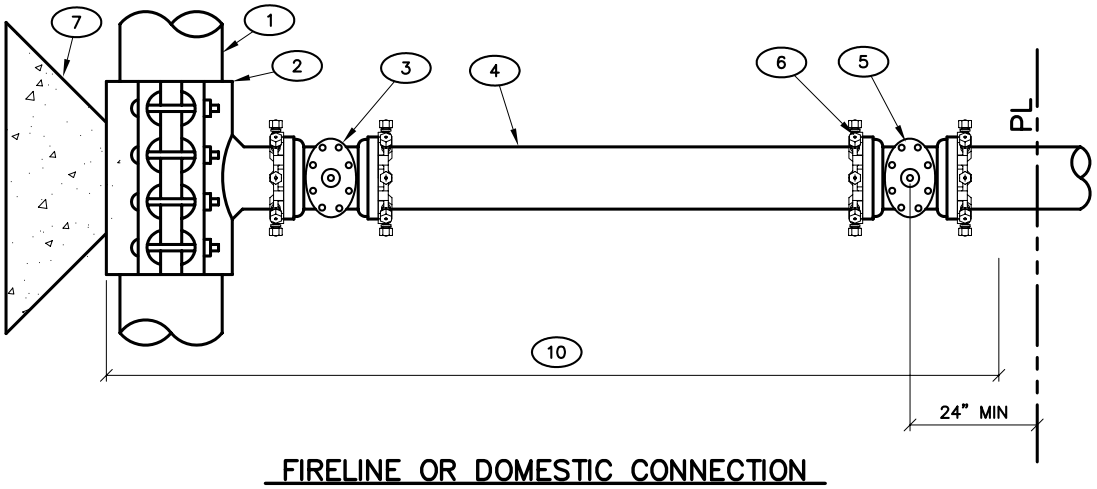
See the Backflow Prevention Section in this booklet and call Denver Water's Backflow Prevention Office at 303-628-5979 for backflow prevention information.

Denver Water normally will install the fire line before the building plumbing is completed. However, if the fire line is installed by Denver Water after the building plumbing is installed, Denver Water will **not** be responsible for connecting to the building plumbing.

Notes



FIRELINE OR DOMESTIC CONNECTION WITH MAIN EXTENSION



FIRELINE OR DOMESTIC CONNECTION

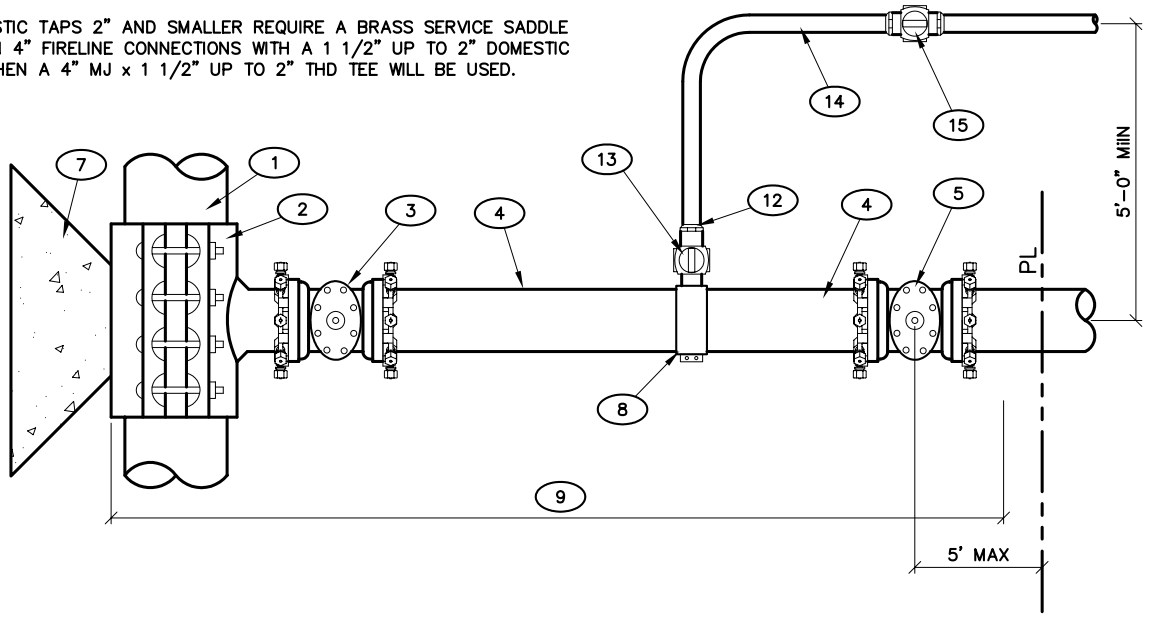
1. EXIST MAIN
2. TAPPING SLEEVE
3. TAPPING VALVE
4. DOUBLE SPIGOT PIPE FULLY RESTRAINED
5. MJ LINE VALVE 2' FROM PL
6. MECHANICAL RESTRAINT
7. CONC KICKBLOCK
8. MJ ANCHORING TEE (SWIVEL TEE WHERE APPLICABLE)
9. MJ VALVE
10. POLYETHYLENE WRAPPED

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628-6000 · Telecopier No.(303)628-6851

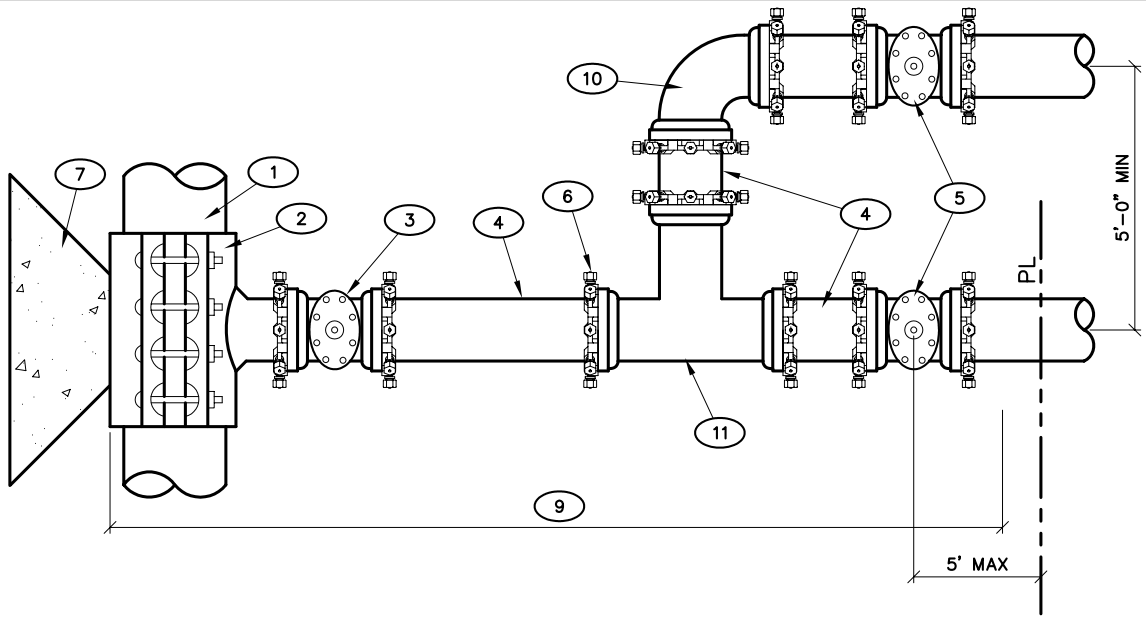
2" AND LARGER DOMESTIC AND FIRELINE CONNECTIONS

Scale: NONE	Date: JULY 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

NOTE:
ALL DOMESTIC TAPS 2" AND SMALLER REQUIRE A BRASS SERVICE SADDLE EXCEPT ON 4" FIRELINE CONNECTIONS WITH A 1 1/2" UP TO 2" DOMESTIC SERVICE THEN A 4" MJ x 1 1/2" UP TO 2" THD TEE WILL BE USED.



FIRELINE CONNECTION WITH DOMESTIC SERVICE TEE UP TO 2"



FIRELINE CONNECTION WITH DOMESTIC SERVICE TEE 3" AND LARGER

1. EXIST MAIN
2. TAPPING SLEEVE OR SWIVEL TEE
3. TAPPING VALVE OR MECHANICAL JOINT GATE VALVE
4. DI DBL SPIGOT PIPE
5. MECHANICAL JOINT GATE VALVE (2' FROM PL)
6. RESTRAINT DEVICE
7. CONC KICKBLOCK
8. BRASS SERVICE SADDLE
9. POLYETHYLENE WRAPPED
10. 90° FITTING
11. MJ TEE
12. SERVICE INSULATOR
13. CORP STOP (UP TO 2")
14. COPPER TUBING (UP TO 2")
15. CURB STOP

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628-6000 · Telecopier No.(303)628-6851

FIRELINE CONNECTION WITH DOMESTIC SERVICE TEE

Scale: NONE	Date: JULY 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

Notes

Recommended Capacities for Tap Request Evaluation

Recommended flow capacity for Automatic Sprinkler Connection taps:

ID Inches	Flow @ 15 fps (1)	Flow @ 20 fps (2)
2”	150 gpm	195 gpm
4”	590 gpm	780 gpm
6”	1,325 gpm	1,760 gpm
8”	2,350 gpm	3,140 gpm
10”	3,675 gpm	4,895 gpm
12”	5,290 gpm	7,050 gpm

Guidelines for maximum allowable domestic flow capacity with service pressure reducing valve (PRV) are (3):

Pipe ID	3/4”	1”	1-1/2”	2”
Flow gpm	16.6	25.0	42.0	77.5
% Meter Capacity	69.1	62.5	52.5	60.5

Realistic service flow values for smaller service lines, based on no more than 20 psi of head loss in 50 feet of service line, not including meter and other losses, are (4):

Pipe ID	5/8”	3/4”	1”
Flow gpm	11.4	16.2	34.6
% Meter Capacity	68.8	66.7	87.5

Guidelines for maximum allowable flows for irrigation only services (5);

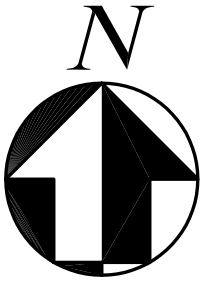
3/4”	-	10.3 gpm	2”	-	73.5 gpm	6”	-	661 gpm
1”	-	18.4 gpm	3”	-	165 gpm	8”	-	1,175 gpm
1-1/2”	-	41.4 gpm	4”	-	294 gpm			

(1) from NFPA 20, section A-2-9.4, ASC systems w/fire pump
(2) Maximum recommended flow velocity w/o fire pump is 20 fps
(3) Pressure reducers required where static pressure exceeds 80 psi from Uniform Plumbing Code 608.2.
(4) From DWD Engineering Standards:
- 3.09-A The combined pressure drop in the service line and meter between the main and the building should not exceed 25 psi (or 35 psi with backflow preventer).
- 3.03-D That portion of the service between the property line and the meter shall not exceed a horizontal length of 60 feet without DWD approval.

(5) Based on a recommended maximum velocity of 7.5 fps through a backflow preventer.

Notes

DISTRICT MAP
WITH INSPECTOR`S PHONE NUMBERS



District 1

Supervisor-Steve Cole
(Office) 303-628-6840
(Cell) 303-994-6793

Inspectors-Tom Elliot 303-994-6863
Gene Keeble 303-994-6809

District 2

Supervisor-Larry Borga
(Office) 303-628-6823
(Cell) 303-994-6819

Inspectors-Ted Rasmussen 303-994-6806

District 3

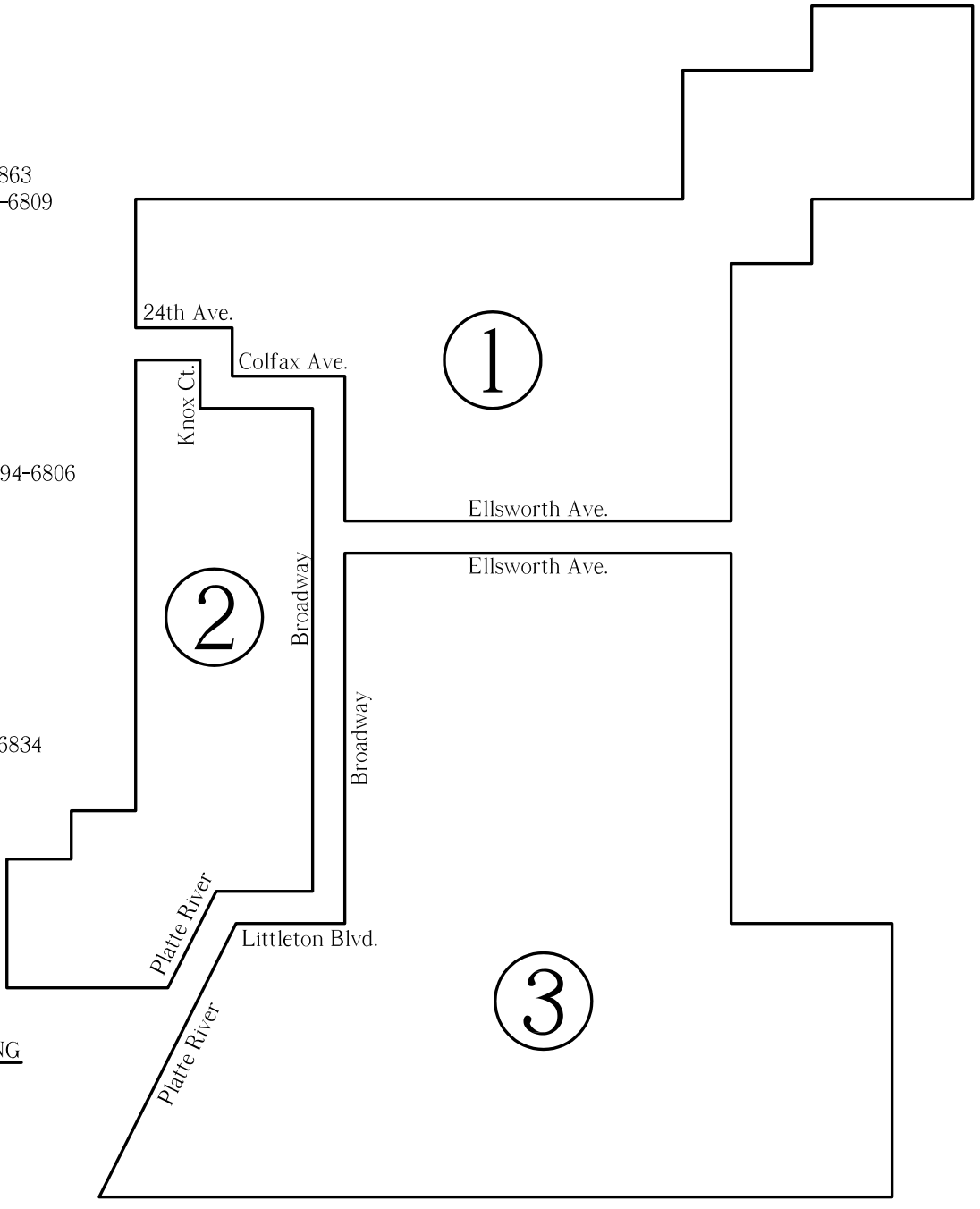
Supervisor-Jeff Bombay
(Office) 303-628-6824
(Cell) 303-994-6861

Inspectors-Marc Miller 303-994-6834

AUTOMATED METER READING

303-628-6701

1 1/2" & LARGER METERS
303-628-6701



Notes

Meters, Meter Settings and Service Lines

Gated communities must allow access to Denver Water at all times. If access codes are changed, contact 303-628-6825 to provide new codes.

General Information

1. All meters must be installed in accordance with the Denver Water *Engineering Standards*, including the standard detail drawings contained in this booklet. Meter settings other than shown and detailed in the *Engineering Standards* are considered non-standard and require prior approval of the proposed piping layout, meter setting, AMR device location, structural vault design or inside setting for each separate installation. Call the district supervisor, the meter shop, or an inspector for approval of these meter settings **before installation**. All materials used in the service line, meter pit/vault, meter setting, meter and AMR installation must conform to the appropriate sections of Denver Water's *Engineering Standards*. When reusing an existing service line from a building that has been demolished, the service line, meter, meter setting and meter pit must be brought into full compliance with the Engineering Standards. Current Engineering Standards may be viewed on Denver Water's web site at www.denverwater.org.

2. Denver Water's Customer Service Field Section reserves the right to establish the location of the meter/pit vault or inside meter setting and the location of the AMR device to assure accuracy of metering, efficient meter reading, proper operation of the AMR system and access for future maintenance.

3. Responsibility for installation:

    a. For ¾-inch and 1-inch meters inside Denver, in Total Service and in Read and Bill Distributor Contract areas, Denver Water will install the meters and AMR devices. Call the Meter Desk at 303-628-6145 at least two full business days in advance to schedule a meter set and AMR installation.

    b. For 1-1/2-inch and larger meters inside Denver, in Total Service and in Read and Bill Distributor Contract areas, a private contractor or plumber must set the meter with the attached factory pre-wired AMR cable and connector coiled up in a plastic bag on the meter. Denver Water will inspect the meter and complete the installation of the AMR device. Call the Meter Shop at 303-628-6706 at least three full business days in advance to schedule a large meter inspection and AMR installation.

    c. Master Meter Distributors install and inspect all meters within their Distributor Contract areas. Master Meter Distributors may or may not require an AMR device on their meters.

4. The street or ground must be at final grade at the time the meter is installed. The pit must be installed so the top of the meter lid is even with the ground or up to one inch below the ground. The owner will be required to raise or lower the meter pit and meter setting when the final grade is established. **The meter yoke must be adjusted to 8-inches below the top of the top concrete ring of the meter pit.** If the grade is changed after the meter is installed in the pit, the owner must adjust the pit and meter setting to grade. If construction activities damage the meter pit or setting, it must be replaced or repaired before the meter will be set or approved. If the meter has already been set, all damage must be repaired and the entire meter pit and setting brought into compliance with the standards before the property is occupied.

5. Before the meter is set or inspected, the property street address must be clearly posted on the building or on a placard. An irrigation service must be identified by the irrigation tap address (which may be different from the building address) on a placard at the meter pit. The lot and block number is not sufficient.

6. If the service line, property valve, meter pit and setting, meter and AMR device are not in full compliance with the Engineering Standards and with any approved construction plans when the Denver Water Meter Inspector arrives for the meter installation/inspection, the meter setting will be rejected and the meter will not be set or approved. The service line will be locked off by the inspector. Water service will not be restored until all deficiencies are corrected. Each additional inspection after the first will incur a re-inspection trip charge.

7. If there is any question about a proposed installation, please contact the district meter inspector or district supervisor (for ¾-inch and 1-inch meters) or the meter shop inspector (for larger meters) at the phone numbers shown on the map on page 34 of this booklet.

Service Line Requirements

1. Service line piping must be Type "K" seamless copper tubing for service lines smaller than 3-inch and ductile iron pipe for service lines 3-inch and larger.

2. The service line, from the tap to a point at least five feet on the building side of the meter pit/vault, must be of the same size and material and the same size as the tap. Service lines may be increased no more than one pipe size five feet downstream (building side) of the outside of the meter pit or vault. The yoke and meter must be the same size as the service line.

3. Service line depth can range between 4-1/2 feet and 6-feet.

4. The service line must run at an angle of 90-degrees to the main, with no bends before the property line valve/curb stop. The valve must be in a direct line between the tap and the meter pit, except for combination fire line/domestic services. The property line valve/curb stop must be within five feet on either side of the property line. The property line valve/curb stop must be in a landscaped area. Any exceptions to these standards must be approved in writing by the Customer Service Field Section **before** construction.

5. Curb stops (3/4-inch through 2-inch) located beneath landscaped areas and sidewalks must have standard stop boxes. Curb stops located beneath streets, and driveways, and all property line valves larger than 2-inches must have standard stop boxes set several inches below the finished pavement grade, with the upper portion of a standard street valve box set over the top of the stop box at the street grade; use bricks or concrete to support the valve box at the proper grade. Curb stops must be located within five feet on either side of the property line. Curb stops can not be located beneath sidewalks, or other paved surfaces unless approved in writing **before** construction by the Customer Service Field Section. Curb stops can never be located beneath areas where vehicles may be parked over them.

6. Head or pressure loss through the service line from the main to the structure being served must not exceed 25 psi (or 35 psi with a backflow preventer) at the maximum flow delivery.

7. For an inside meter setting the service line must not exceed a total length of 60-feet measured from the water main in the street to the meter setting. If the service line will be longer than 60 feet, the meter must be installed in a pit or vault. If the domestic service line is tapped off of a fire line, the 60 foot length includes that portion of the fire line between the main and the domestic tap and the domestic service line before the meter setting.

8. Connections for sprinkler systems, vacuum breakers, backflow preventers or any other purpose are not permitted ahead of the meter pit/vault, inside the meter pit/vault, or within five feet downstream (building side) of the meter pit/vault. No connections can be made to the service pipe in the meter pit or vault or before the meter outlet valve on an inside meter setting.

9. If a pressure regulating valve (PRV) is required, it must be set correctly on the downstream side of the meter. For indoor installations, it must be downstream of the outlet valve; for outdoor installations (meters larger than 2 inches only) it must be at least 5 feet downstream of the pit/vault, placed in accordance with local plumbing code requirements.

10. Valves 3-inch and larger must be right-hand open, non-rising stem gate valves (see Section 6.23 and MS-4, MS-4A and MS-21 of Denver Water's *Engineering Standards* for additional information).

11. Recycled Water irrigation service lines must be purple plastic or Type "K" copper wrapped with purple tape (see Chapter 11 of Denver Water's *Engineering Standards* for additional information). The meter will be painted purple by Denver Water when nonpotable recycled water becomes available. Meters purchased from a supplier other than Denver Water specifically for recycled water service shall be furnished with purple registers.

Small Outdoor Meter (3/4-inch and 1-inch Meter in Pits) Installation Requirements:

1. Unless otherwise approved before construction, the meter pit or vault must be 2 to 5 feet downstream (building side) of the curb stop. The curb stop shall be within five feet on either side of the property line with a location on the street/easement side of the line preferred.

2. Meter settings for meters 2-inches and smaller must include approved yokes that include a valve in the pit. Resetters are not permitted on new installations in meter pits (see Section 6.25 of the *Engineering Standards* for additional information).

3. The center of the meter yoke flow line (the meter nuts) must be 8-inches below the top of the top concrete ring.

4. New and replacement parts for Clark yokes and Ford yokes are no longer available. If reusing a service with a Clark or Ford yoke installed, replace the yoke with a standard V.I.P (valve in pit) yoke installed in full compliance with the standards. It may be necessary to replace to meter pit to provide adequate room for the standard yoke.

5. Meter pits and covers must be in conformance with Section 6.27 and MS-23 of the *Engineering Standards*. Meter pits and covers and the area two feet around them must be free of obstructions or hazards and properly adjusted to grade.

6. The meter pit dome must be cast iron or aluminum. The top lid must be cast iron, as specified below. The dome must have an inner plastic frost lid with a 2-inch to 3-inch deep "pan" or a stepped design with a 3-inch center recess, a lifting handle molded in, three to five ¼-inch diameter drain holes in the bottom and a slot the full depth of the lip to allow the AMR device wire to pass through.

7. Meter Pit Covers/Lids

8. Cast iron meter pit covers must have a recess approximately 7 inches in diameter and approximately ¾-inch deep with a 2-inch diameter hole to accommodate the AMR device.

9. Cast Iron manhole covers shall have one or two recesses to accommodate AMR devices where required. The recess shall be approximately 7-inches in diameter and approximately ¾-inch deep with a 2-inch diameter hole in the center.

10. Meter pits are not permitted in driveways, parking lots or sidewalks without approval before construction from Denver Water's Meter Inspector. Meter pits may never be placed beneath parking spaces. Call the Meter Inspector or District Supervisor to obtain written permission before installing a meter pit or vault in a paved area. Most such installations will require the installation of a standard manhole with a recess for the AMR device, mounted over a standard meter pit, in accordance with Denver Water's standard. Special AMR configurations are usually required for installations in traffic areas.

11. Before the meter is set, the top of the pit lid must be adjusted to the final grade. The lid must sit level and horizontal, at grade or up to one inch below grade. The pit installation must be free of obstructions and hazards for at least two feet in all directions. If necessary, the pit must be adjusted to grade again after landscaping, at the time of the first property transfer before occupancy.

Large Outdoor Meter (1-1/2-inch and Larger in Vaults) Installation Requirements:

1. Contact the meter inspector at 303-628-6706 to arrange an on-site meeting with the designers, owner's representative, and/or contractors to review the proposed meter installation. The inspector will be able to help locate the meter vault, property line valve, bypass piping, and the tap to help make sure the completed installation will pass inspection. When calling, it is helpful to have available the name of the project and its Denver Water Plan Review ID number, if applicable, so the inspector can review the approved plans before the on-site meeting.

2. Meter settings for meters 2-inches and smaller must include approved yokes that include a valve in the pit. Resetters are not permitted on new installations in meter pits. (See Section 6.25 of Denver Water's *Engineering Standards* for additional information)

3. Meter pits and vaults are not permitted in driveways, parking areas or sidewalks without written approval before construction from Denver Water's Meter Inspector. Special pits and lids are required in areas subject to traffic or parking, and special AMR device configurations may be needed. Call the meter inspector before installing a meter pit or vault in a paved area.

4. A meter vault lid may be adjusted to grade using no more than 16 inches of riser rings.

5. Meter vaults vary by size of meter. See Denver Water's *Engineering Standards* and the drawings in this booklet for details.

6. In most cases, a remote AMR device will be installed on a nearby building wall or on a post adjacent to the meter vault. The contractor shall furnish conduit and approved signal cable from the meter location to the ERT location for field-splicing by Denver Water's Meter Inspector. With remote AMR devices, a solid 24-inchmanhole cover is required for the vault cover.

7. Manhole rings and covers must be in conformance with Section 6.31 of the *Engineering Standards*. A 24-inch manhole cover with a recess for an AMR device is available from local waterworks supply companies. This is the only acceptable method of installing an AMR device through the pit/vault lid in a high-traffic area.

Small Indoor Meter (3/4-inch and 1-inch) Installation Requirements:

1. In buildings with basements, the meter must be installed in the basement as close to the front wall of the building as possible, on the wall where the service enters the building, in conformance with the appropriate drawing contained in this booklet. The service line must be no longer than 60feet, measured from the water main to the meter. A floor drain must be located near the meter for new installations, but may not be required for a meter in an existing location.

2. In homes without basements (slab homes), the meter may be installed indoors only under the following conditions: the meter must be installed in a clearly-defined utility room (rough-ins for a water heater or heating system will provide evidence that it is a utility room) that is heated and contains a floor drain. The meter setting must be as close as possible to the point where the service line enters the building, and must be fully accessible at all times. The service line may not pass beneath the garage floor. The service line must be no longer that 60 feet, measured from the water main to the meter.

3. Whether it is a basement or slab home installation, the meter must be set within 100 feet of an acceptable location for the AMR device. Normally, the device will be mounted on the inside front wall of the house, either near the basement ceiling or the inside wall of the utility room or garage. The device must be accessible for maintenance, on the face of the wall if the space is finished. If the AMR device location requires more than 20 feet of wiring, the owner must provide and install the cable from the AMR device location to the meter location. Cable must be as specified in the Materials Section of this booklet. **No other brand or model of cable is acceptable**.

4. Inside meter settings require Stop and Waste Valves on the upstream (street) side of the meter, at least 6 inches away from the yoke, in conformance with MS-21, Paragraph 5 of the *Engineering Standards*. Ball valves with a waste are acceptable.

5. Inside meter settings require an outlet valve on the downstream (building) side of the meter. The valve must be located at least 6 inches away from the arms of the meter yoke/setter. Since water flow is generally up from the floor, the outlet valve will be above the meter yoke.

6. The meter must be set so the top of the meter register is not more than 40 inches from the floor and no more than 18 inches away from the wall. The outlet valve must not be more than 54 inches above the floor. The meter, valves and AMR device must remain accessible for maintenance and reading. If enclosed for aesthetic reasons, the entire enclosure must be removable to allow access to the meter, piping, valves, and AMR device. See the drawing in this booklet for the size of access openings required for enclosed meters and AMR devices. Proper insulation must be installed to prevent the meter and water piping from freezing.

7. No connections and no changes of service pipe diameter are permitted between the curb stop at the street and the outlet valve downstream of the meter.

Large Indoor Meter (1-1/2-inch and Larger) Installation Requirements:

1. The meter must be located in a well-lit, heated, accessible location to permit maintenance and testing and to avoid damage from freezing. The meter must be set in the basement if there is one, or at the point nearest where the service line enters the building. A floor drain must be located within 10-feet of the meter.

2. The meter must be within 150 feet of an acceptable location for the AMR device (250 feet for Badger Meters only). In some cases, the device will be mounted on the inside front wall of the building, either near the basement ceiling or on the inside wall of the utility/mechanical room. In most cases, the AMR device will be located on the outside of the front wall of the building, pointed directly toward a public street. The owner must provide a suitable method for mounting the AMR device on the outside of the building and an opening for the wire to pass through the wall. The AMR device must be accessible for maintenance, on the face of the wall, normally a weather-proof double-gang electrical box mounted approximately 7 feet above finished grade. The AMR device must be accessible for maintenance, on the face of the interior wall if the space is finished. If the AMR device location requires more than 20 feet of wiring, the owner must provide and install the cable in conduit from the AMR device location to the meter location.

3. If the meter is a compound meter, two AMR devices may be required, one for each register. Some compound meters use a mechanical register that only requires a single AMR device (check with the meter supplier). Electronic accumulators that combine the readings from two mechanical registers to a single AMR device are not permitted. If two devices are needed, two separate cable runs will be required.

Special Provisions for 1-1/2-inch and Larger Meters – Inside and Outside:

1. A bypass is required on all large meters unless otherwise approved in writing by the Meter Inspector (303-628-6706). This does not apply to meters that are used for irrigation only.

2. 1-1/2-inch and 2-inch meters must be properly supported by concrete blocks.

3. 3-inch and larger meters must be properly supported by a concrete block or pad with no more than a ½-inch steel shim, if needed.

4. Valves 3-inches and larger must be supported by adjustable steel valve supports

Automatic Meter Reading (AMR) Equipment

1. Automatic Meter Reading devices must be provided for each register of every meter. Appropriate factory-sealed wiring must be attached to the meter register when it is purchased. Meters intended for indoor installation must be furnished with an Itron Remote ERT; meters intended for pit or vault installation will usually be furnished with an Itron Pit ERT, although special circumstances may require a remote ERT for a pit meter, as determined by the Denver Water Customer Service Field Section.

2. For indoor residential installations, the AMR device will be mounted as close as possible to the meter setting and normally within 20 feet. In basement settings, the AMR device will normally be mounted near the ceiling on the street side of the house. In slab homes, it will be mounted on the inside of an interior wall on the street side of the house. In some cases, especially if the house siding is stucco or steel, it may be necessary to mount the AMR device on the outside of the house, usually on the side of the house near the corner closest to the street.

For outside installations, the owner shall provide a suitable mounting device, such as a standard double-gang electrical box, on the face of the building for the AMR device.

3. The AMR device and adjacent wiring must be accessible for periodic maintenance and battery changes. It must not be boxed in or hidden behind walls or ceilings unless a suitable access opening at least 18 inches square is provided.

4. Special configurations may be needed to allow the AMR device to be read from the street, especially with indoor meter settings, with meter pits not located adjacent to the street and with pits/vaults located in traffic areas. It may be necessary to mount the AMR device on the outside wall of the building approximately 7 feet above the finished grade, or on a post near the meter pit, or in another location some distance from the meter. In such cases, the owner may be required to furnish cable meeting the AMR equipment manufacturer's specifications, for connection to the meter register and the AMR device. Commercial/industrial settings require the cable to be in conduit. Conduit is not required by Denver Water for residential settings, but may be required by local electrical inspectors. Cable must meet Itron requirements as specified in the Materials section of this booklet. No other brand or model of cable is acceptable.

5. The meter installer/inspector will advise the owner or owner's representative of any modifications that may be needed.

6. In the case of a meter pit/vault in a heavy traffic area, a Remote ERT may be mounted on a pole or pedestal up to 150 feet away from the meter pit/vault. The contractor will install a conduit-encased cable from the meter location to the AMR device location and Denver Water personnel will connect the meter and device to the wire at the time of meter installation/inspection. The contractor will supply a suitable impact-resistant plastic or metal enclosure that will accommodate a standard padlock for protection of the AMR device.

Guidelines for Service Line And Meter Capacities

Service Flows From Uniform and International Plumbing Codes
Meter Flows From AWWA Manual M-22
3/29/2006

Diameter	Maximum Flow	High Normal Meter Flows (3)		
	@ Velocity	Meter Type		
	10 ft/sec(1,2)	Displacement	Turbine	Compound
3/4"	14	15		
1"	25	25		
1.5"	55	50	80	
2"	98	80	100	80
3"	221		240	160
4"	392		420	250
6"	881		920	500
8"	1567		1600	800
10"	2450		2500	

All flows in gallons per minute (gpm)

(1) Uniform Plumbing Code A 6.1: Velocities shall not exceed 10 ft/sec

(2) International Plumbing Code Figure E103.3(2): Fluid velocities in excess of 5 to 8 ft/sec are not usually recommended

(3) AWWA Manual M-22 Table 6.1

Service Line Headloss as a Faction of Diameter, Length, and Flow*

All Calculations are Based on New Pipe Installation
Pipe C–value (frictional coefficient) = 130 Type K Copper Service

Pipe Flow 5 gpm

Pipe Diameter			Length of Pipe in Feet							
			25	50	75	100	125	150	175	200
3/4"	0.745	in.		2.3	3.4	4.6	5.7	6.8	8.0	9.1
1"	0.995	in.	0.3	0.6	0.8	1.1	1.4	1.7	2.0	2.2
1–1/4"	1.245	in.	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
1–1/2"	1.481	in.	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3
2"	1.959	in.	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
			Resulting Pressure Loss in psi							

Pipe Flow 10 gpm

Pipe Diameter			Length of Pipe in Feet							
			25	50	75	100	125	150	175	200
3/4"	0.745	in.	4.1	8.2	12.3	16.5	20.6	24.7	28.8	32.9
1"	0.995	in.	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.1
1–1/4"	1.245	in.	0.3	0.7	1.0	1.4	1.7	2.0	2.4	2.7
1–1/2"	1.481	in.	0.1	0.3	0.4	0.6	0.7	0.9	1.0	1.2
2"	1.959	in.	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3
			Resulting Pressure Loss in psi							

Pipe Flow 15 gpm

Pipe Diameter			Length of Pipe in Feet							
			25	50	75	100	125	150	175	200
3/4"	0.745	in.	8.7	17.4	26.1	34.8	43.5	52.3	61.0	69.7
1"	0.995	in.	2.1	4.3	6.4	8.5	10.7	12.8	14.9	17.0
1–1/4"	1.245	in.	0.7	1.4	2.1	2.9	3.6	4.3	5.0	5.7
1–1/2"	1.481	in.	0.3	0.6	0.9	1.2	1.5	1.8	2.2	2.5
2"	1.959	in.	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.6
			Resulting Pressure Loss in psi							

Pipe Flow 20 gpm

Pipe Diameter			Length of Pipe in Feet							
			25	50	75	100	125	150	175	200
3/4"	0.745	in.	14.8	29.7	44.5	59.3	74.2	89.0	103.8	118.6
1"	0.995	in.	3.5	7.3	10.9	14.5	18.1	21.8	25.4	29.0
1–1/4"	1.245	in.	1.2	2.4	3.7	4.9	6.1	7.3	8.5	9.8
1–1/2"	1.481	in.	0.5	1.0	1.6	2.1	2.6	3.1	3.7	4.2
2"	1.959	in.	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1.1
			Resulting Pressure Loss in psi							

Service Line Headloss as a Faction of Diameter, Length, and Flow*

(continued)

Pipe Flow 25 gpm

Pipe Diameter			Length of Pipe in Feet							
			25	50	75	100	125	150	175	200
3/4"	0.745	in.	22.4	44.8	67.2	89.6	112.0	134.5	156.9	179.3
1"	0.995	in.	5.5	11.0	16.4	21.9	27.4	32.9	38.4	43.9
1–1/4"	1.245	in.	1.8	3.7	5.5	7.4	9.2	11.1	12.9	14.7
1–1/2"	1.481	in.	0.8	1.6	2.4	3.2	4.0	4.8	5.5	6.3
2"	1.959	in.	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6
			Resulting Pressure Loss in psi							

Pipe Flow 30 gpm

Pipe Diameter			Length of Pipe in Feet							
			25	50	75	100	125	150	175	200
3/4"	0.745	in.	31.4	62.8	94.2	125.6	157.0	188.4	219.8	251.2
1"	0.995	in.	7.7	15.4	23.0	30.7	38.4	46.1	53.8	81.5
1–1/4"	1.245	in.	2.6	5.2	7.7	10.3	12.9	15.5	18.1	20.7
1–1/2"	1.481	in.	1.1	2.2	3.3	4.4	5.5	6.7	7.8	8.9
2"	1.959	in.	0.3	0.6	0.9	1.1	1.4	1.7	2.0	2.3
			Resulting Pressure Loss in psi							

Pipe Flow 35 gpm

Pipe Diameter			Length of Pipe in Feet							
			25	50	75	100	125	150	175	200
3/4"	0.745	in.	41.8	83.5	125.3	167.0	208.8	250.6	292.8	234.1
1"	0.995	in.	10.2	20.4	30.7	40.9	51.1	61.3	71.5	81.7
1–1/4"	1.245	in.	3.4	6.9	10.3	13.7	17.2	20.6	24.0	27.5
1–1/2"	1.481	in.	1.5	3.0	4.4	5.9	7.4	8.9	10.3	11.8
2"	1.959	in.	0.4	0.8	1.1	1.5	1.9	2.3	2.6	3.0
			Resulting Pressure Loss in psi							

Pipe Flow 40 gpm

Pipe Diameter			Length of Pipe in Feet							
			25	50	75	100	125	150	175	200
3/4"	0.745	in.	53.5	106.9	160.4	213.9	267.3	320.8	374.2	427.9
1"	0.995	in.	13.1	26.2	39.2	52.3	65.4	78.5	91.6	104.6
1–1/4"	1.245	in.	4.4	8.8	13.2	17.6	22.0	26.4	30.8	35.2
1–1/2"	1.481	in.	1.9	3.8	5.7	7.6	9.4	11.3	13.2	15.1
2"	1.959	in.	0.5	1.0	1.5	1.9	2.4	2.9	3.4	3.9
			Resulting Pressure Loss in psi							

*Calculations as per AWWA Manual M–22

Additional Guidelines for Estimated Headloss In Meter Yokes & Backflow Prevention Devices

In 1998 Denver Water conducted several tests on 1" meter and yoke combinations to determine rates of headloss under various flow conditions. Two types of meter yokes were tested, long & short radius. The following is a brief summary of the results:

	Long Radius Type	Short Radius Type
Flow Rate (gpm)	Headloss (psi)	
5.0	0.2	0.0
15.0	2.3	2.5
25.0	6.4	7.0
35.0	11.8	13.0

The following information represents headloss in backflow prevention devices(*):

	Backflow Preventer Diameter								
	3/4"	1"	1.5"	2"	3"	4"	6"	8"	10"
Flow Rate (gpm)	Headloss Across Backflow Preventer in psi								
10	13.2	12.7							
20	14.5	13.6	11.0	10.8					
30	16.0	14.2							
40		15.2	12.0	11.2					
50		16.7							
75			13.6	11.8					
100			15.3	12.2					
125				12.9					
150				14.1					
200					11.5	11.0			
300					13.0	11.5			
400					15.0	12.0	10.5		
500					17.5	13.5	10.5		
750						15.0	11.0		
800						16.0	12.0	11.0	9.5
1000						18.0	13.5	11.0	9.5
1500							17.0	12.5	10.5
1800							19.0	14.0	11.0
2000								15.0	11.5
2500								18.0	12.5
2800								19.0	13.0
3600									17.0

Headloss information as shown is representative based on manufacturer information for Reduced Pressure Backflow Preventers. Actual valves may vary from one manufacturer to another.

GENERAL METER NOTES

1. METER LOCATION SHALL BE APPROVED BY DENVER WATER'S CUSTOMER SERVICE FIELD SECTION. METER SETTINGS LARGER THAN ONE INCH SHALL BE APPROVED IN THE FIELD BY THE METER SHOP PRIOR TO INSTALLATION OF ANY SERVICE PIPE OR TAP. CALL 303.628.6706 TO MAKE APPOINTMENT FOR ON-SITE APPROVAL MEETING.

2. METER PITS AND CURB STOPS SHALL BE LOCATED IN GRASSY LANDSCAPED AREAS, UNLESS OTHERWISE APPROVED PRIOR TO INSTALLATION BY THE CUSTOMER SERVICE FIELD SECTION. METER PITS MAY NOT BE PLACED IN DRIVEWAYS OR SIDEWALKS.

3. ALL METER SETTINGS LARGER THAN ONE INCH MUST BE INSPECTED BY CUSTOMER SERVICE FIELD SECTION BEFORE BEING BACKFILLED. METERS WILL NOT BE SET/APPROVED UNLESS METER SETTING AND SERVICE LINE ARE IN FULL COMPLIANCE WITH THE ENGINEERING STANDARDS, STANDARD DRAWINGS, AND APPROVED PROJECT DRAWINGS AS APPLICABLE.

4. IF STREET OR GROUND IS NOT TO FINAL GRADE AT TIME OF METER INSTALLATION OR INSPECTION, OWNER MUST RAISE OR LOWER THE METER PIT/VAULT WHEN FINAL GRADE IS ESTABLISHED. METER SETTING MUST BE ADJUSTED TO STANDARDS (EIGHT INCHES BELOW TOP METER PIT RING FOR METERS ONE INCH AND SMALLER, WITH PIT LID ONE HALF INCH BELOW FINISHED GRADE) AFTER PIT/VAULT GRADE IS ADJUSTED.

5. DOMESTIC WATER SERVICES SHALL RUN AT A NINETY DEGREE ANGLE FROM WATER MAIN WITH NO BENDS, NO CHANGES IN PIPE SIZE OR PIPE MATERIAL, AND NO CONNECTIONS UNTIL FIVE FEET PAST THE METER PIT OR VAULT (FOR INDOOR METERS, UNTIL FIVE FEET PAST THE CURB STOP). NO JOINTS ARE PERMITTED WITHIN THE METER PIT OR VAULT, EXCEPT AS SHOWN ON STANDARD DRAWINGS.

6. BYPASS IS REQUIRED ON ALL METERS ONE AND ONE HALF INCH AND LARGER, EXCEPT FOR IRRIGATION SERVICES. BYPASSES ARE NOT PERMITTED ON IRRIGATION SERVICES.

7. ALL MATERIALS USED FOR SERVICE PIPES, VALVES, METER SETTINGS AND METERS SHALL CONFORM TO APPLICABLE SECTIONS OF THE ENGINEERING STANDARDS, LATEST EDITION. ALL VARIANCES AND DEVIATIONS MUST BE APPROVED BY CUSTOMER SERVICE FIELD SECTION PRIOR TO INSTALLATION.

8. METERS SHALL BE FURNISHED WITH ITRON ERTS, WHICH WILL BE INSTALLED BY DENVER WATER AT TIME OF METER INSTALLATION OR INSPECTION.

9. IF METER PIT LOCATIONS DO NOT PERMIT DRIVE-BY RADIO READING FROM A PUBLIC STREET, IT MAY BE NECESSARY TO INSTALL A REMOTE ERT, WITH SUITABLE SIGNAL CABLE ENCASED IN CONDUIT FROM THE METER TO THE ERT, OR TO INSTALL ADDITIONAL RADIO EQUIPMENT SUCH AS AN ITRON MICRO NETWORK. OWNER SHALL PROVIDE A SUITABLE LOCATION, APPROVED BY DENVER WATER CUSTOMER SERVICE FIELD SECTION, FOR MOUNTING REMOTE ERT SUCH THAT AN ADEQUATE RADIO SIGNAL IS RECEIVED TO PERMIT DRIVE-BY METER READING FROM A DEDICATED PUBLIC STREET. ALL SUCH INSTALLATIONS SHALL BE AT THE OWNER'S EXPENSE.

10. ANY METER SETTING OTHER THAN THOSE SPECIFICALLY SHOWN AND DETAILED HEREIN SHALL BE CONSIDERED NON-STANDARD AND SHALL REQUIRE PRIOR APPROVAL BY CUSTOMER SERVICE FIELD SECTION, BASED ON DRAWINGS SHOWING ENTIRE SERVICE LINE, FITTINGS, METER SETTING, LOCATION OF NEAREST PUBLIC STREET, AND STRUCTURAL DESIGN OF VAULT. METERS AND VALVES IN PAVED AREAS REQUIRE SPECIAL MATERIALS AND CONSTRUCTION METHODS. METERS AND CURB STOPS/VALVES MAY NOT BE PLACED IN AREAS WHERE VEHICLES MAY PARK OVER THEM.

11. BACKFLOW PREVENTION DEVICES MAY BE REQUIRED IN CONFORMANCE WITH SECTION 6.11.

12. A FLOOR DRAIN IS REQUIRED WITHIN TEN FEET OF THE METER FOR ALL NEW INSIDE METER SETTINGS. INSIDE SETTINGS SHALL BE INSTALLED ONLY IN BASEMENTS OR IN UTILITY ROOMS IN BUILDINGS WITHOUT BASEMENTS.

13. INSIDE METER SETTINGS ARE ONLY PERMITTED WHERE TOTAL LENGTH OF SERVICE LINE, MEASURED ALONG CENTERLINE OF PIPE, DOES NOT EXCEED SIXTY FEET FROM TAP OR TEE ON STREET MAIN TO INLET OF METER.

14. ALL REFERENCES TO ELECTRONIC DIGITAL ENCODERS OR MECHANICALLY ENCODED REGISTERS WITH ITRON ERT ARE APPLICABLE TO DENVER, TOTAL SERVICE, AND READ AND BILL DISTRICTS ONLY. THIS REQUIREMENT IS NOT APPLICABLE TO MASTER METER DISTRICTS.

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
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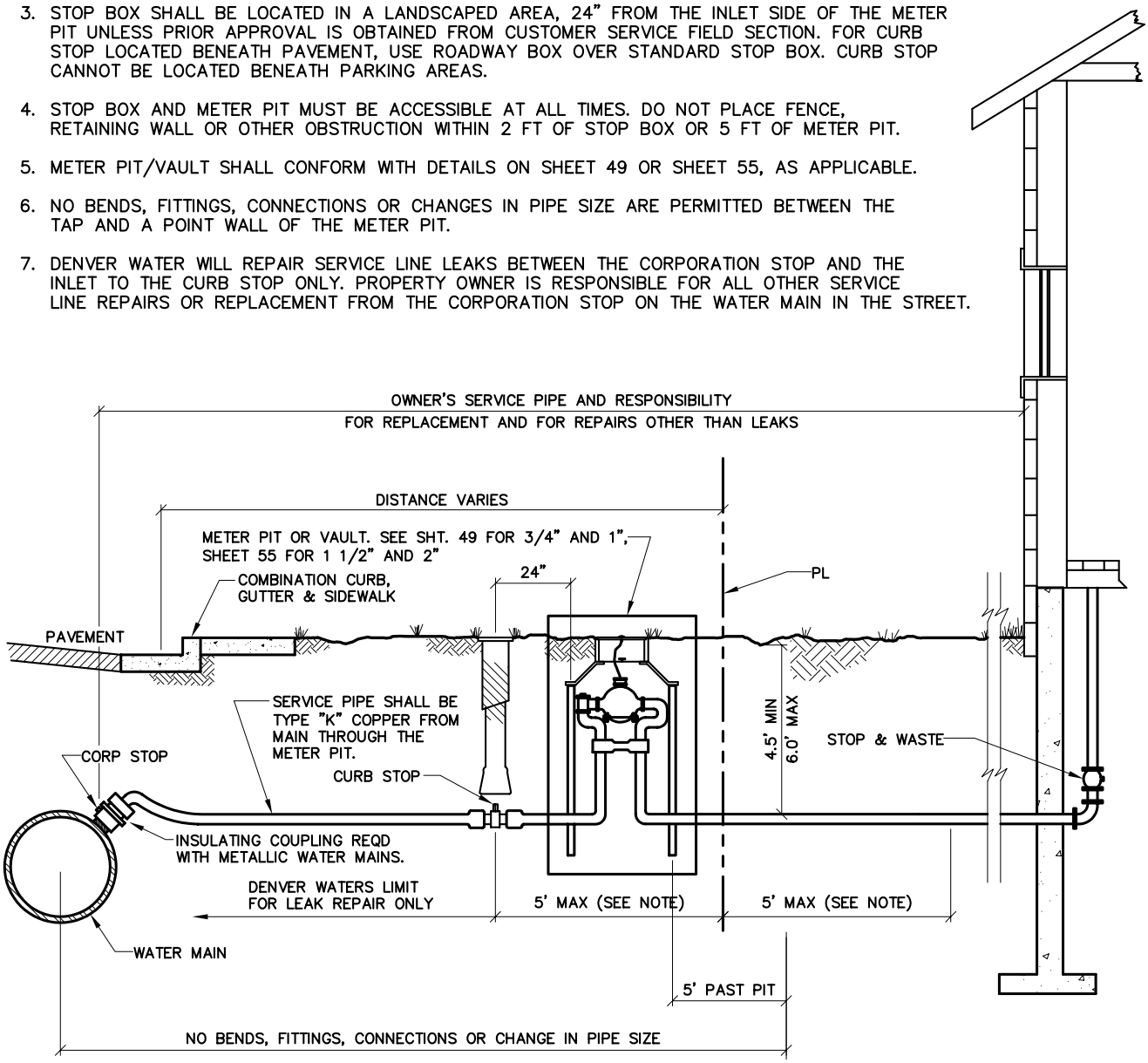
GENERAL METER NOTES

Scale: NONE	Date: AUGUST 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

NOTES:

1. PLACEMENT OF STOP BOX CAN VARY FROM A MAX OF 5 FT OUTSIDE THE PL TO A MAX OF 5 FT INSIDE THE PL. PLACEMENT OF THE STOP BOX IN THE PUBLIC ROW IS PREFERRED.
2. IF THERE IS A TREE LAWN, BOTH CURB STOP AND METER PIT MUST BE LOCATED BETWEEN CURB AND SIDEWALK.
3. STOP BOX SHALL BE LOCATED IN A LANDSCAPED AREA, 24" FROM THE INLET SIDE OF THE METER PIT UNLESS PRIOR APPROVAL IS OBTAINED FROM CUSTOMER SERVICE FIELD SECTION. FOR CURB STOP LOCATED BENEATH PAVEMENT, USE ROADWAY BOX OVER STANDARD STOP BOX. CURB STOP CANNOT BE LOCATED BENEATH PARKING AREAS.
4. STOP BOX AND METER PIT MUST BE ACCESSIBLE AT ALL TIMES. DO NOT PLACE FENCE, RETAINING WALL OR OTHER OBSTRUCTION WITHIN 2 FT OF STOP BOX OR 5 FT OF METER PIT.
5. METER PIT/VAULT SHALL CONFORM WITH DETAILS ON SHEET 49 OR SHEET 55, AS APPLICABLE.
6. NO BENDS, FITTINGS, CONNECTIONS OR CHANGES IN PIPE SIZE ARE PERMITTED BETWEEN THE TAP AND A POINT WALL OF THE METER PIT.
7. DENVER WATER WILL REPAIR SERVICE LINE LEAKS BETWEEN THE CORPORATION STOP AND THE INLET TO THE CURB STOP ONLY. PROPERTY OWNER IS RESPONSIBLE FOR ALL OTHER SERVICE LINE REPAIRS OR REPLACEMENT FROM THE CORPORATION STOP ON THE WATER MAIN IN THE STREET.



ANY VARIATION FROM THIS STANDARD REQUIRES APPROVAL PRIOR TO INSTALLATION FROM CUSTOMER SERVICE FIELD SECTION.

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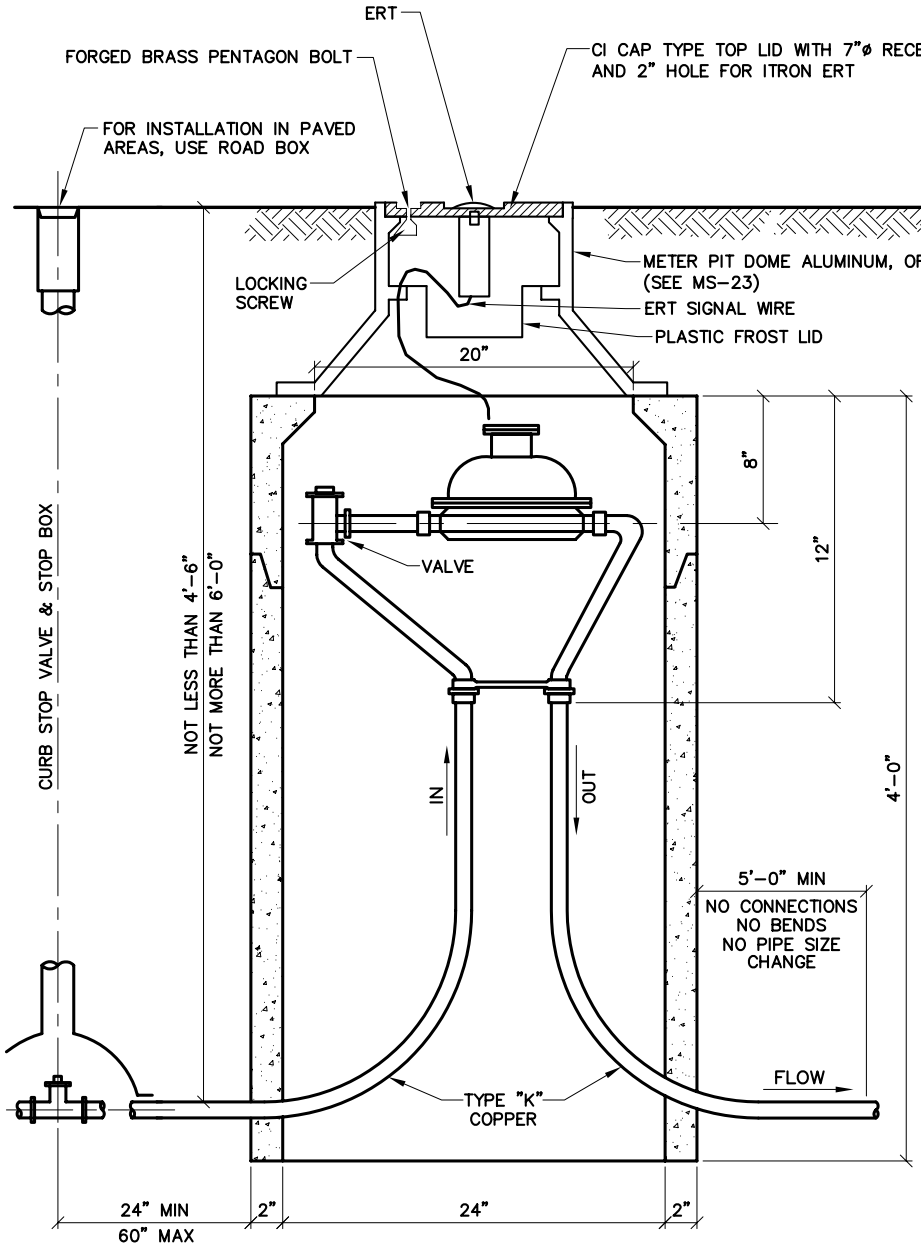
SERVICE LINE, STOP BOX AND OUTSIDE METER INSTALLATION

Scale: NONE	Date: AUGUST 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

Notes



GENERAL NOTES:

1. ANY VARIATION OR DEVIATION FROM THIS STANDARD REQUIRES PREVIOUS APPROVAL PRIOR TO INSTALLATION FROM CUSTOMER SERVICE FIELD SECTION.
2. METER PIT MUST BE INSTALLED IN LANDSCAPED AREA. PRIOR APPROVAL REQD FOR INSTALLATIONS IN ROADWAYS, DRIVEWAYS OR SIDEWALKS. ROAD LIDS OR OTHER SPECIAL MODIFICATIONS MAY BE REQD.
3. CURB STOP SHALL BE 24 INCHES FROM INLET SIDE OF METER PIT, LOCATED IN LANDSCAPED AREA IF POSSIBLE. WITH PRIOR APPROVAL OF METER INSPECTOR, CURB STOP MAY BE PLACED BENEATH PAVED AREA UNDER ROADWAY BOX, BUT NOT IN A PARKING AREA.
4. ALL METER PITS SHALL BE FURNISHED WITH CI METER PIT LID WITH 7 1/2 INCH ø x 3/4 INCH DEEP RECESS AND 2 INCH ø CENTER HOLE FOR ITRON ERT, PLUS THREE DRAIN HOLES IN RECESSED AREA.
5. ALL METER PITS SHALL BE FURNISHED WITH PLASTIC FROST LID WITH 3 INCH DEEP PAN, FIVE DRAIN HOLES, LIFTING HANDLE, AND SLOT FOR ERT WIRE RUNNING FULL DEPTH OF LIP.
6. METER PIT SHALL BE CONSTRUCTED OF A COMBINATION OF CONC RINGS WITH A TOTAL HEIGHT OF 48 INCHES (SECTION 6.27). ADJUSTMENT RINGS OF APPROVED PLASTIC OR CONC SHALL BE INSERTED BETWEEN TOP RING AND DOME. RINGS MUST BE 2 INCH, 3 INCH, 4 INCH, OR 6 INCH HEIGHT. NO CONC FLOOR ALLOWED IN METER PITS. PLASTIC METER PITS ARE NOT PERMITTED. PIT SHALL BE INSTALLED TO MAINTAIN PIT LID 1/2 INCH BELOW FINISHED GRADE.
7. NO BENDS PERMITTED IN SERVICE LINE BETWEEN TAP AND 5 FT BEYOND OUTLET SIDE OF METER PIT. NO CHANGES IN PIPE ø OR CONNECTIONS OF ANY TYPE ARE PERMITTED IN THE SERVICE LINE UNTIL 5 FT OR MORE FROM THE OUTLET SIDE OF THE METER PIT.
8. METER SHALL BE FURNISHED WITH ELECTRONIC DIGITAL REGISTER OR ELECTRONIC ENCODED REGISTER AND AN ITRON PIT ERT. IN SPECIAL CASES, A REMOTE ERT MAY BE REQD, MOUNTED ON A NEARBY BUILDING OR POST.

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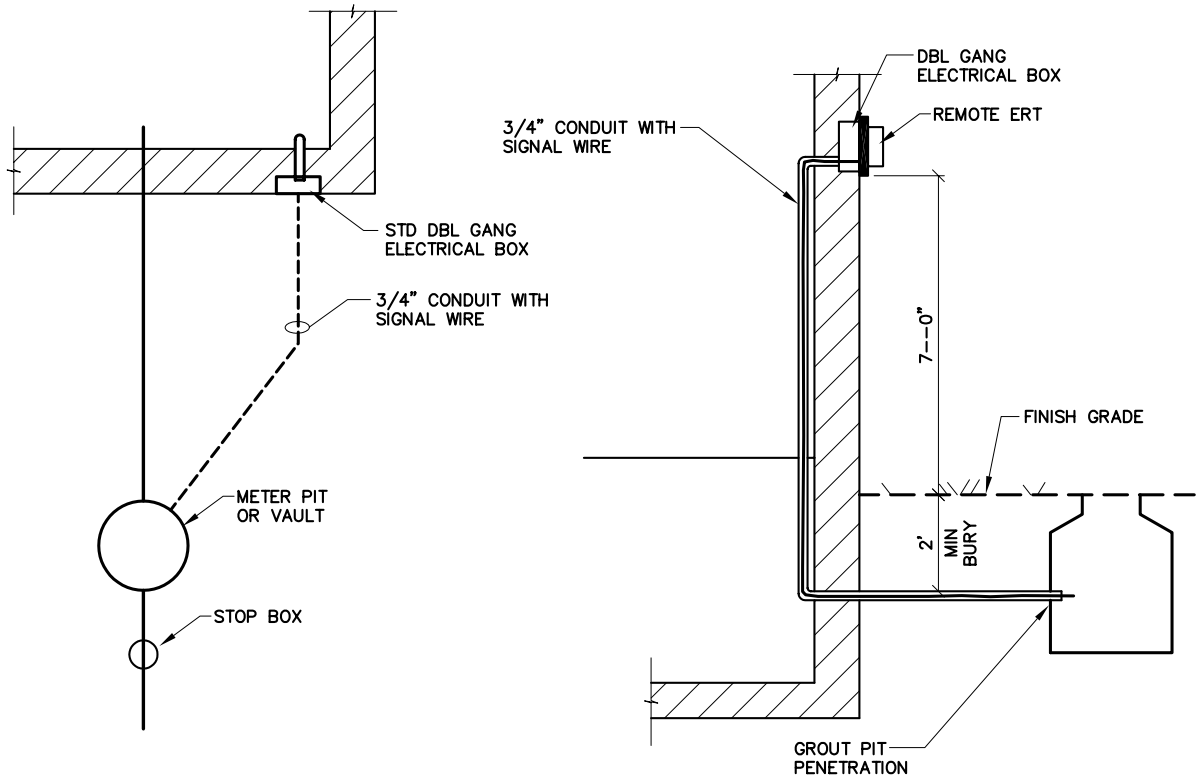
OUTSIDE SETTING FOR 3/4" AND 1" METERS

Scale: NONE	Date: AUGUST 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

NOTE:

IF WIRE LENGTH EXCEEDS 150 FT ONLY BADGER METER MAY BE USED.



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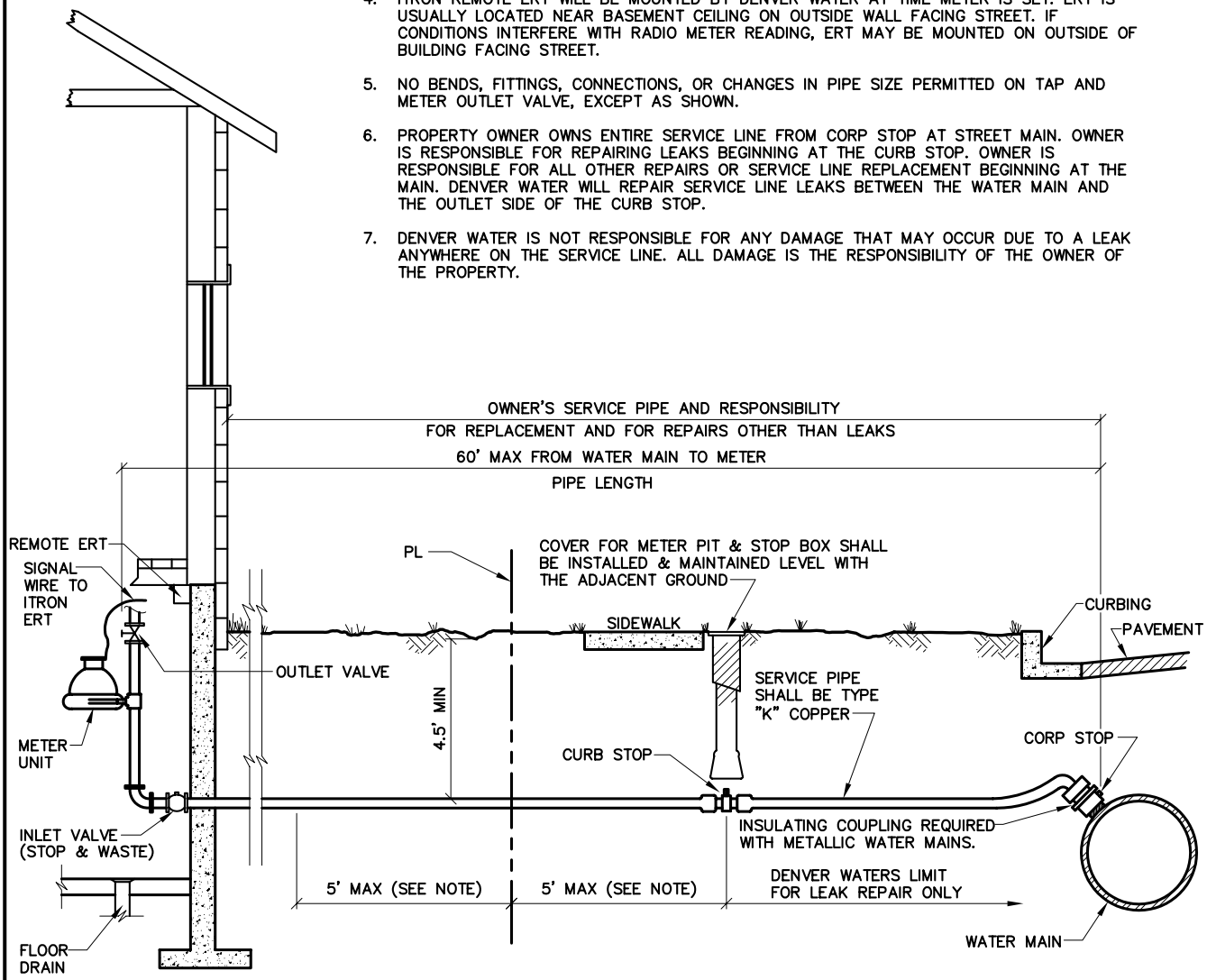
METER PIT WITH REMOTE ERT INSTALLATION ON OUTSIDE BUILDING WALL

Scale: NONE	Date: DECEMBER 2003	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

Notes

NOTES:

1. PLACE STOP BOX WITHIN 5 FT EITHER SIDE OF PL. PLACEMENT OUTSIDE PL IS PREFERRED.
2. INDOOR METER SETTING IS PERMITTED ONLY IF TOTAL LENGTH OF SERVICE PIPE DOES NOT EXCEED 60 FT FROM MAIN TO METER SETTING.
3. INDOOR METER SHALL BE PLACED IN BASEMENT WITH FLOOR DRAIN NEARBY.
4. ITRON REMOTE ERT WILL BE MOUNTED BY DENVER WATER AT TIME METER IS SET. ERT IS USUALLY LOCATED NEAR BASEMENT CEILING ON OUTSIDE WALL FACING STREET. IF CONDITIONS INTERFERE WITH RADIO METER READING, ERT MAY BE MOUNTED ON OUTSIDE OF BUILDING FACING STREET.
5. NO BENDS, FITTINGS, CONNECTIONS, OR CHANGES IN PIPE SIZE PERMITTED ON TAP AND METER OUTLET VALVE, EXCEPT AS SHOWN.
6. PROPERTY OWNER OWNS ENTIRE SERVICE LINE FROM CORP STOP AT STREET MAIN. OWNER IS RESPONSIBLE FOR REPAIRING LEAKS BEGINNING AT THE CURB STOP. OWNER IS RESPONSIBLE FOR ALL OTHER REPAIRS OR SERVICE LINE REPLACEMENT BEGINNING AT THE MAIN. DENVER WATER WILL REPAIR SERVICE LINE LEAKS BETWEEN THE WATER MAIN AND THE OUTLET SIDE OF THE CURB STOP.
7. DENVER WATER IS NOT RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR DUE TO A LEAK ANYWHERE ON THE SERVICE LINE. ALL DAMAGE IS THE RESPONSIBILITY OF THE OWNER OF THE PROPERTY.



ANY VARIATION FROM THIS STANDARD REQUIRES APPROVAL PRIOR TO INSTALLATION FROM CUSTOMER SERVICE FIELD SECTION.

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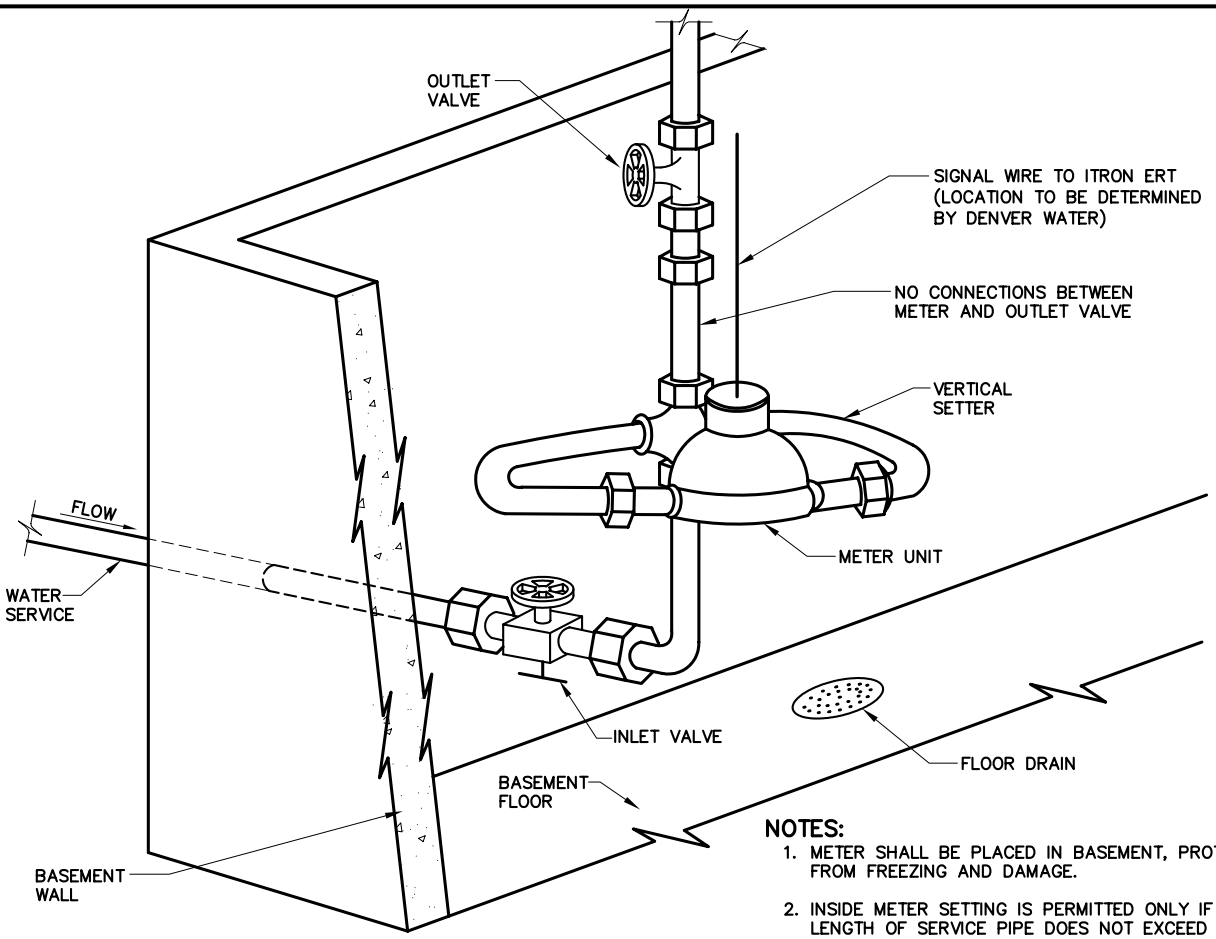
SERVICE LINE, STOP BOX AND INSIDE METER INSTALLATION FOR 3/4" AND 1" METERS

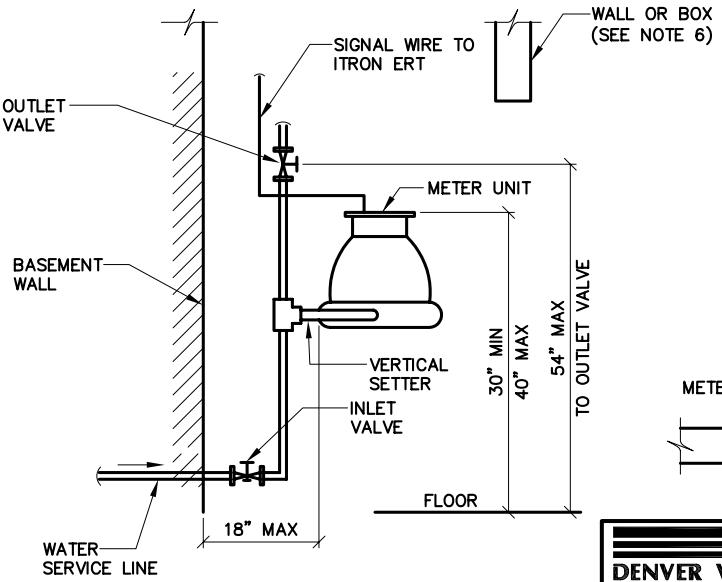
Scale: NONE	Date: AUGUST 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35



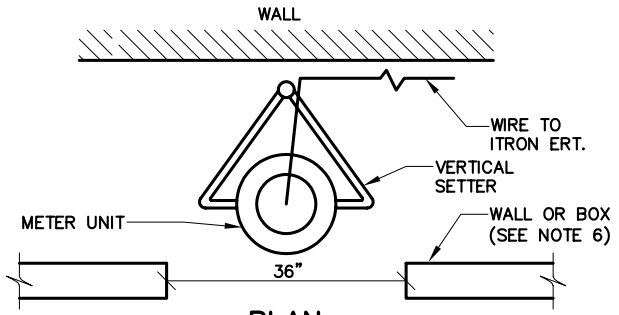
ISOMETRIC VIEW

NOTES:

1. METER SHALL BE PLACED IN BASEMENT, PROTECTED FROM FREEZING AND DAMAGE.
2. INSIDE METER SETTING IS PERMITTED ONLY IF TOTAL LENGTH OF SERVICE PIPE DOES NOT EXCEED 60 FT FROM MAIN TO METER SETTING.
3. A FLOOR DRAIN IS REQD WITHIN 10 FT OF THE METER FOR ALL NEW METER INSTALLATIONS (RECOMMENDED FOR EXISTING INSTALLATIONS).
4. NO CONNECTIONS ARE PERMITTED BEFORE THE METER OUTLET VALVE EXCEPT AS SHOWN ON THIS DRAWING.
5. METERS REQUIRE ELECTRONIC DIGITAL ENCODER REGISTER OR MECHANICALLY ENCODED REGISTER WITH ITRON REMOTE ERT AND 10 FT OF SIGNAL CABLE. ERT IS NORMALLY LOCATED NEAR BASEMENT CEILING AT WALL FACING STREET, BUT MAY BE MOUNTED ON OUTSIDE OF BUILDING.
6. IF METER IS BOXED IN OR PLACED BEHIND A WALL, PROVIDE ACCESS OPENING 36" WIDE FROM ABOVE OUTLET VALVE TO FLOOR.



ELEVATION

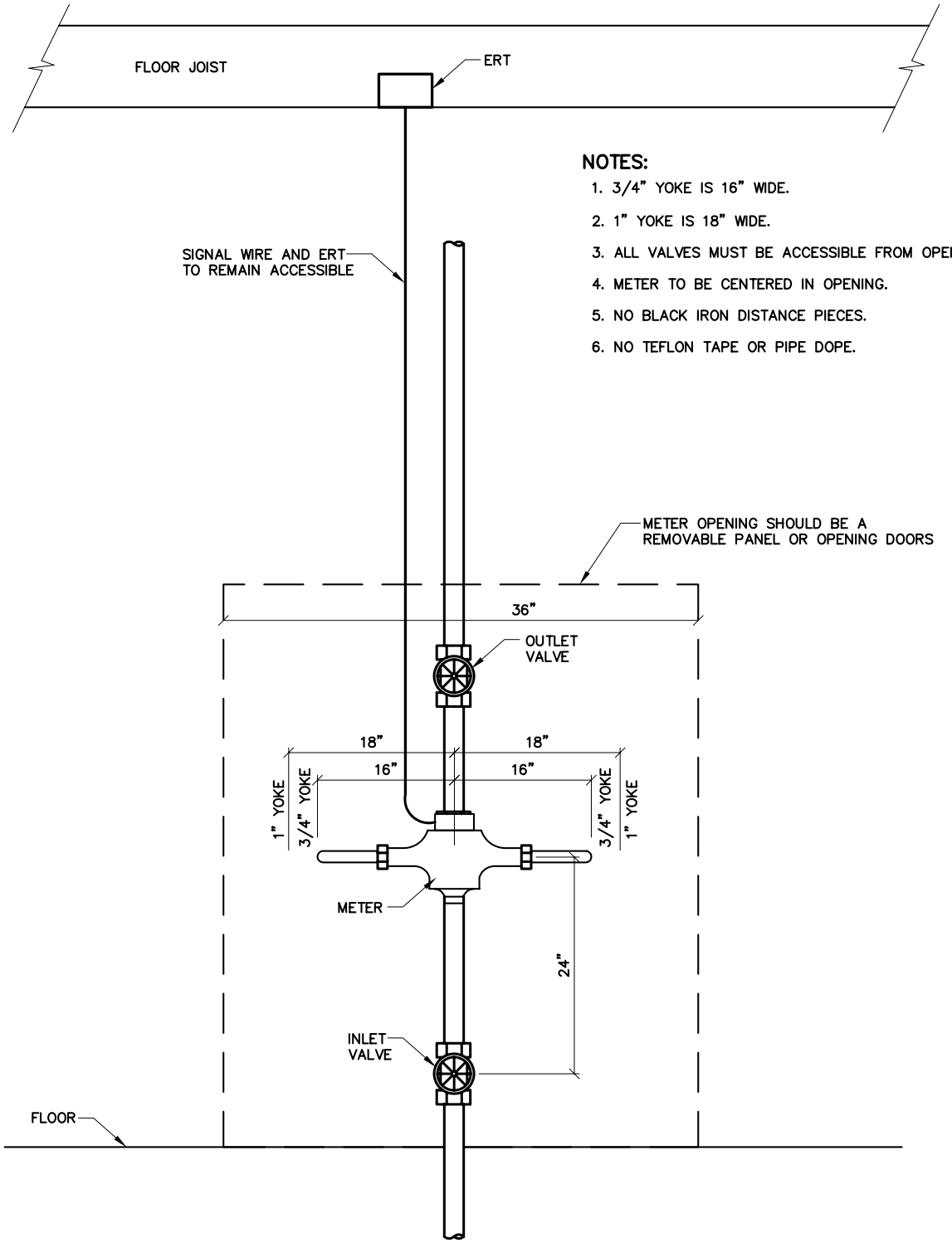


PLAN

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628-6000 · Telecopier No.(303)628-6851

TYPICAL INSIDE SETTING FOR 3/4" AND 1" METER WITH AMR

Scale: NONE	Date: AUGUST 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35



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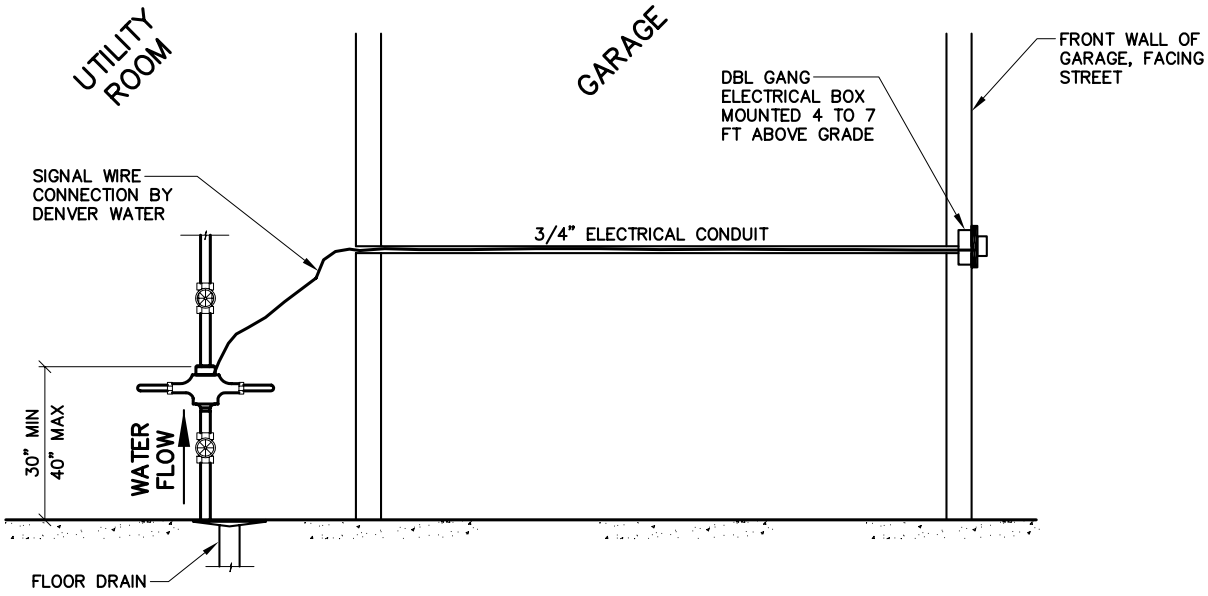
TYPICAL INSIDE SETTING FOR 3/4" AND 1" METER WITH AMR

Scale: NONE	Date: AUGUST 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35



NOTES:

1. METER SHALL BE INSTALLED IN HEATED UTILITY ROOM WITH FLOOR DRAIN.
2. BUILDER INSTALLS ELECTRICAL CONDUIT AND DBL GANG ELECTRICAL BOX AS SHOWN. PULL SIGNAL CABLE TO WITHIN 5 FT OF METER LOCATION WITH OTHER END IN ELECTRICAL BOX.
3. DENVER WATER WILL CONNECT SIGNAL CABLE TO METER AND INSTALL ERT ON ELECTRICAL BOX.
4. SEE SHEETS 50, 51 AND 52 FOR SERVICE AND SETTING DETAILS.
5. TOTAL LENGTH OF SERVICE PIPE FROM TAP AT MAIN TO WATER METER CANNOT EXCEED 60 FT.
6. MAX LENGTH OF SIGNAL CABLE IS 150 FT.
7. SERVICE PIPE MAY NOT BE PLACED BENEATH FLOOR SLAB; PLACE METER WHERE PIPE ENTERS BUILDING FOOTPRINT.

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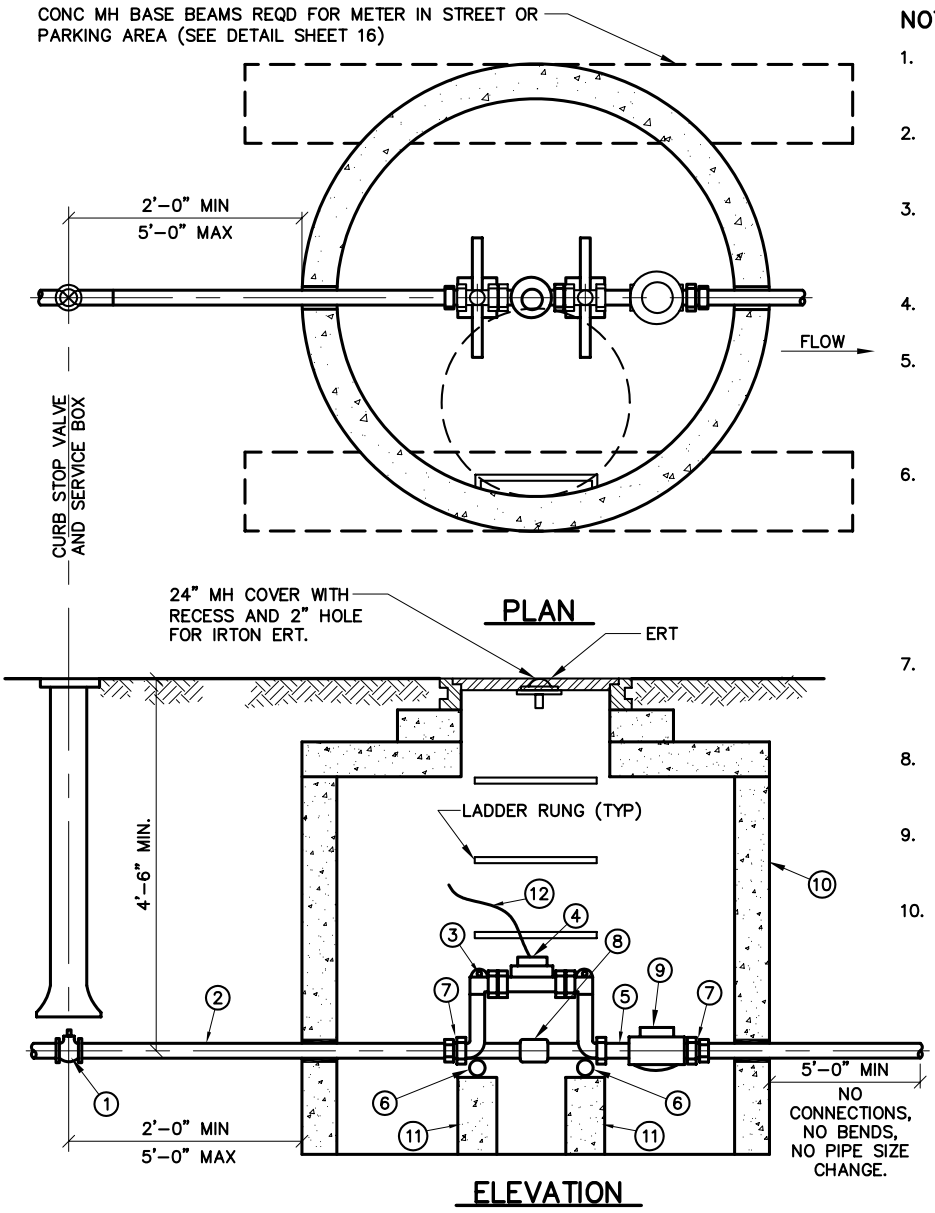
INSIDE METER SETTING AND REMOTE ERT INSTALLATION FOR HOME BUILT ON SLAB

Scale: NONE	Date: DECEMBER 2003	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

Notes



NOTES:

1. METER VAULT SHALL BE INSTALLED IN LANDSCAPED AREA UNLESS APPROVED BY METER INSPECTOR.
2. CURB STOP SHALL BE 24" TO 60" FROM THE INLET SIDE OF THE METER VAULT, IN LANDSCAPED AREA.
3. FOR VAULT INSTALLATIONS IN ROADWAYS AND DRIVEWAYS, WHEN APPROVED, MH BASE BEAMS ARE REQD. METER VAULT MAY NOT BE INSTALLED IN PARKING AREA.
4. NO CONC FLOOR ALLOWED IN METER VAULT.
5. NO CONNECTIONS OF ANY TYPE, PIPE BENDS, OR CHANGES IN PIPE SIZE ARE PERMITTED BETWEEN THE TAP AND 5 FT BEYOND THE OUTLET SIDE OF THE METER VAULT, EXCEPT AS SHOWN ON THIS DETAIL.
6. METER SHALL BE FURNISHED WITH ELECTRONIC DIGITAL REGISTER OR ELECTRONIC ENCODED REGISTER AND AN ITRON PIT ERT. 24" MH LID SHALL HAVE 7" ø RECESS AND 2"ø HOLE TO ACCOMMODATE PIT ERT. IN SPECIAL CIRCUMSTANCES, REMOTE ERT MAY BE REQD (SEE SHEET 50), TO BE INSTALLED ON NEARBY BUILDING OR POST.
7. JOINTS INSIDE METER VAULT SHALL BE THD OR SHALL BE SOLDERED WITH 95-5 TIN/ANTIMONY SOLDER IN ACCORDANCE WITH ASTM B 32.
8. DISTANCE BETWEEN RUNGS, CLEATS AND STEPS SHALL NOT EXCEED 12" AND SHALL BE UNIFORM THROUGHOUT THE LENGTH OF THE LADDER.
9. VAULT WALL PENETRATIONS SHALL BE GROUTED WITH CONC.
10. COPPERSETTER OR METER YOKE SHALL BE NO MORE THAN 12" HIGH. IRRIGATION SERVICE INSTALLATIONS SHALL NOT HAVE METER BYPASS. ALL OTHER SERVICES SHALL USE COPPERSETTER OR YOKE WITH BYPASS AND LOCKING BYPASS VALVE.

DETAILS:

(1) CURB STOP

(2) TYPE K COPPER TUBING

(3) 12" COPPERSETTER / METER YOKE WITH BYPASS

(4) METER UNIT

(5) 3" NIPPLE BETWEEN COPPERSETTER AND CHECK VALVE

(6) 1" x 23" PIPE

(7) IRON PIPE TO FLARE COUPLING FROM INLET SIDE OF COPPERSETTER AND OUTLET SIDE OF CHECK VALVE

(8) BY-PASS WILL BE 1" FOR 1 1/2" COPPERSETTERS AND 1 1/2" OR 1 1/4" FOR 2" COPPERSETTERS- NO BYPASS FOR IRRIGATION METERS

(9) CHECK VALVE (CHECK VALVES ARE NOT REQUIRED WHERE A BACKFLOW PREVENTION DEVICE IS INSTALLED)

(10) 48" CONC MH WITH FLAT LID

(11) CONC BLOCK SUPPORTS 4" x 4" x 24"

(12) SIGNAL WIRE TO ITRON ERT

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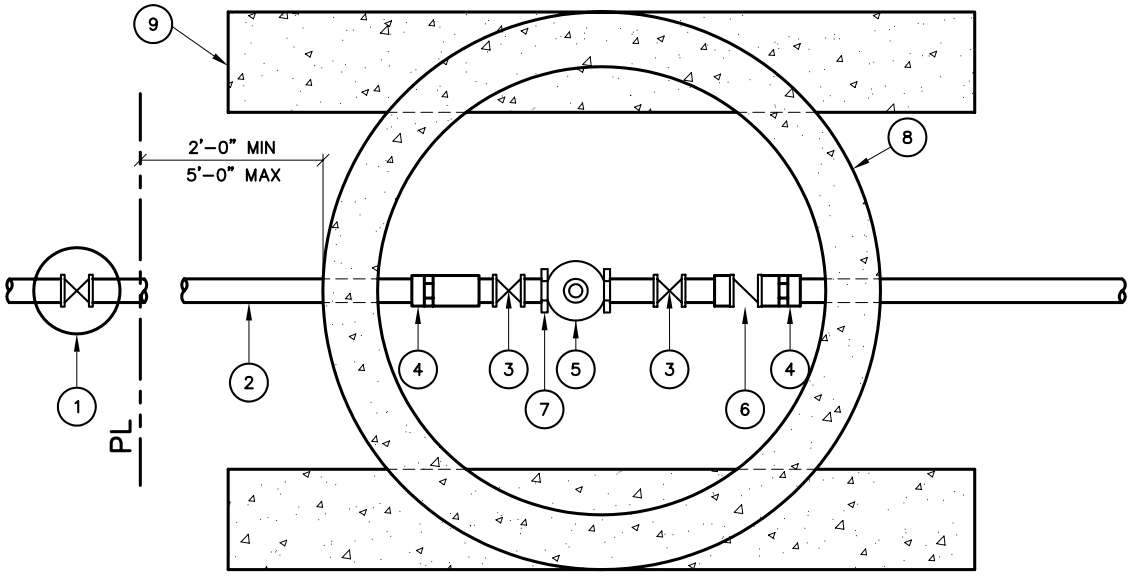
Phone(303)628-6000 · Telecopier No.(303)628-6851

OUTSIDE SETTING FOR 1 1/2" AND 2" METER WITH CHECK VALVE AND BYPASS IN MANHOLE

Scale: NONE	Date: NOV. 1995	
Drawn: RVM	Tr:	Ck:
Approved:	Dr. 127	No. 35



1. CURB STOP VALVE AND SERVICE BOX
2. TYPE K COPPER TUBING
3. GATE VALVE
4. FLARED COPPER TO IRON COUPLING OR DENVER WATER APPROVED EQUAL
5. METER
6. CHECK VALVE (NOT REQD IF BACKFLOW DEVICE IS INSTALLED)
7. FLANGE LOC PAC COUPLING
8. 48" CONC MH
9. CONC MH BASE BEAMS USED ONLY FOR TRAFFIC AREAS

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628-6000 · Telecopier No.(303)628-6851

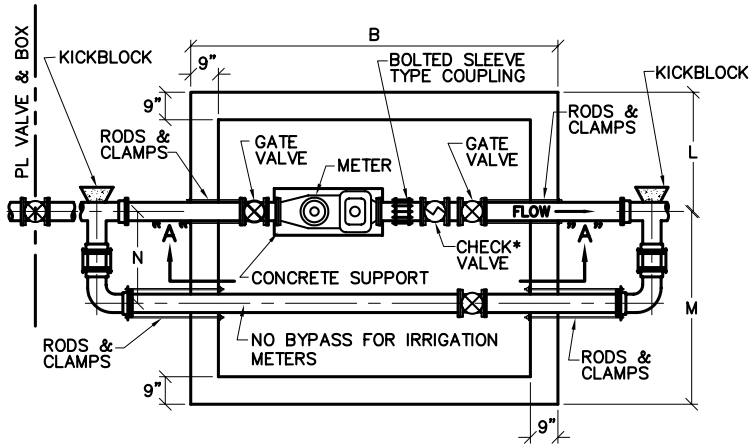
OUTSIDE SETTING FOR 1 1/2" & 2" IRRIGATION METER IN VAULT

Scale: NONE	Date: AUGUST 1995	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

Notes

REVISED 2004

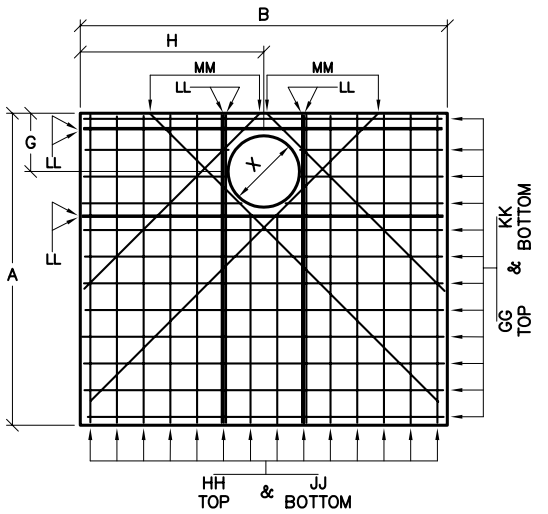
* CHECK VALVES ARE NOT REQUIRED WHERE A BACKFLOW PREVENTION DEVICE IS INSTALLED.



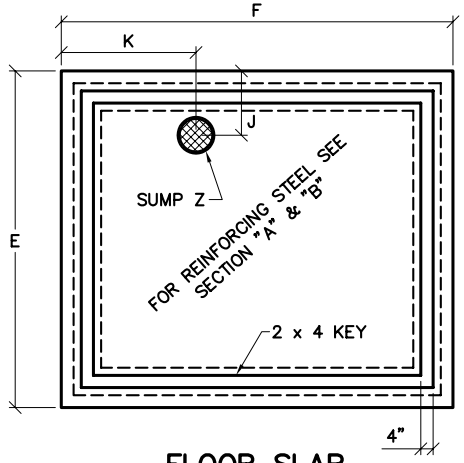
PLAN OF PIPING

NOTE:
1" MASTIC TYP @ ALL RODS THRU WALLS.

LL= TOP OR BOTTOM MM= BOTTOM ONLY

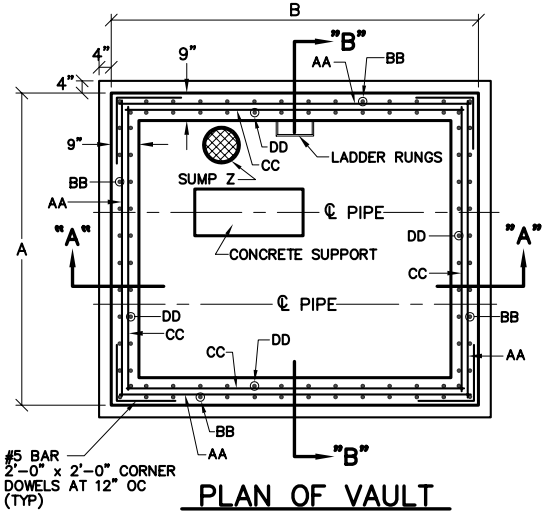


ROOF SLAB

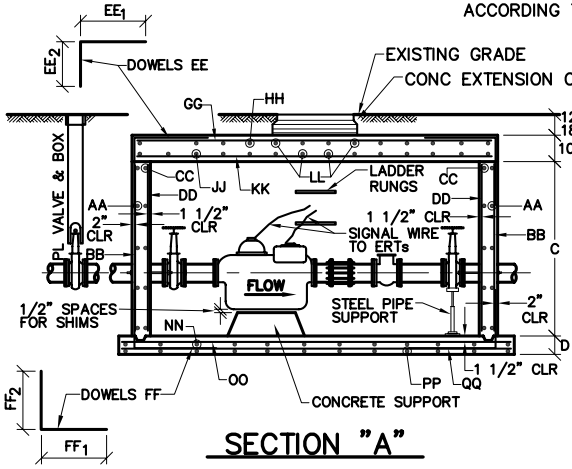


FLOOR SLAB

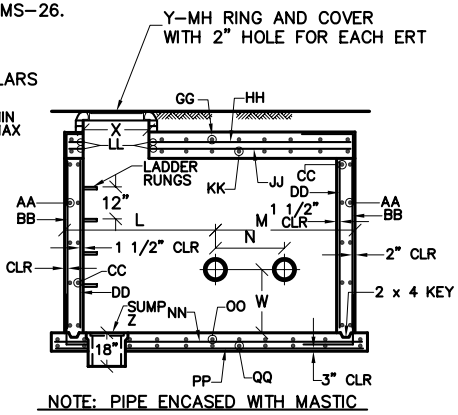
NOTE:
THE ROOF SLAB MAT BE CAST IN SECTIONS FOR FUTURE ACCESS. THE INDIVIDUAL SECTION WEIGHT MUST NOT EXCEED 7,500 POUNDS ACCORDING TO MS-26.



PLAN OF VAULT



SECTION "A"



NOTE: PIPE ENCASED WITH MASTIC

SECTION "B"

SEE SHEET NO. 57 FOR DIMENSIONS CORRESPONDING TO THIS DRAWING.

NOTE:
EACH METER REQUIRES AN ELECTRONIC DIGITAL ENCODER OR MECHANICALLY ENCODED REGISTER WITH AN ITRON ERT EXCEPT FOR MASTER METER DISTRIBUTORS DENVER WATER WILL DETERMINE TYPE OF ERT AND LOCATION PRIOR TO VAULT INSTALLATION.

NOTE:
THE DISTANCE BETWEEN RUNGS, CLEATS AND STEPS SHALL NOT EXCEED 12 INCHES AND SHALL UNIFORM THROUGHOUT THE LENGTH OF THE LADDER.

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628-6000 · Telecopier No.(303)628-6851

COMPOUND METER WITH BOTH CHECK VALVE AND BYPASS

Scale: NONE Date: AUGUST 1995

Drawn: C.B.B. Tr: Ck:

Approved: Dr. 127 No. 35

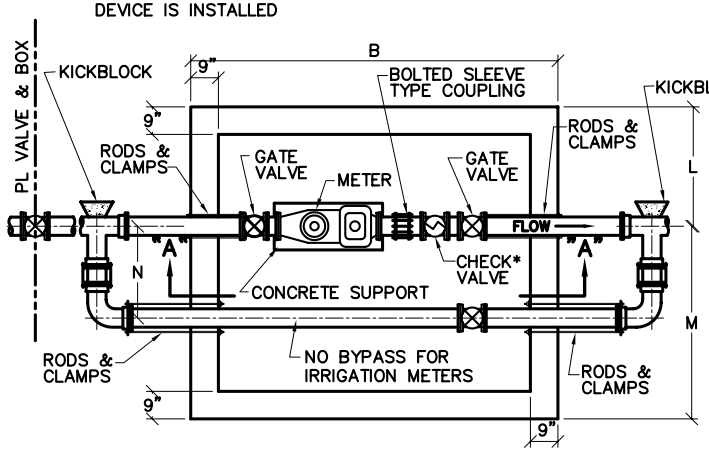
60

SHEET 60

REVISED 2004

61

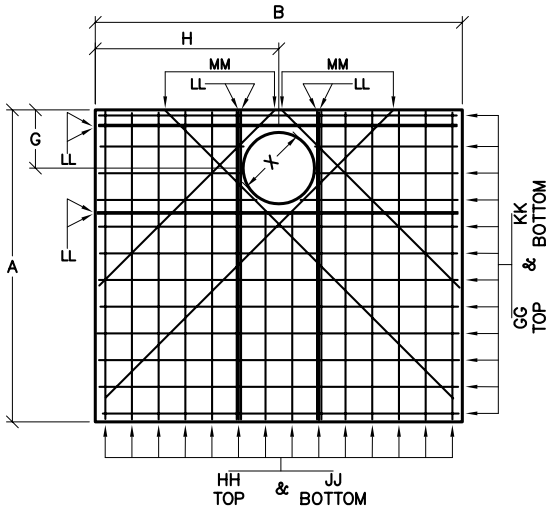
*CHECK VALVES ARE NOT REQUIRED WHERE A BACKFLOW PREVENTION DEVICE IS INSTALLED



PLAN OF PIPING

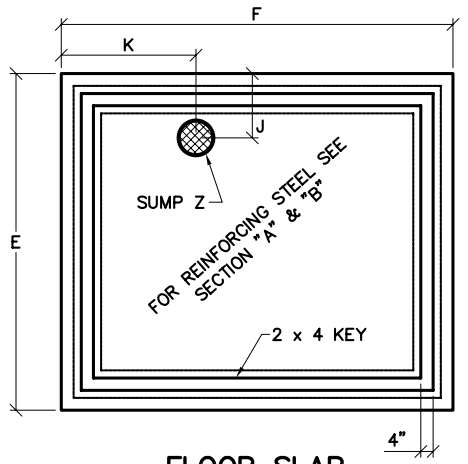
NOTE:
1" MASTIC @ ALL RODS THRU WALLS.

LL= TOP OR BOTTOM MM= BOTTOM ONLY

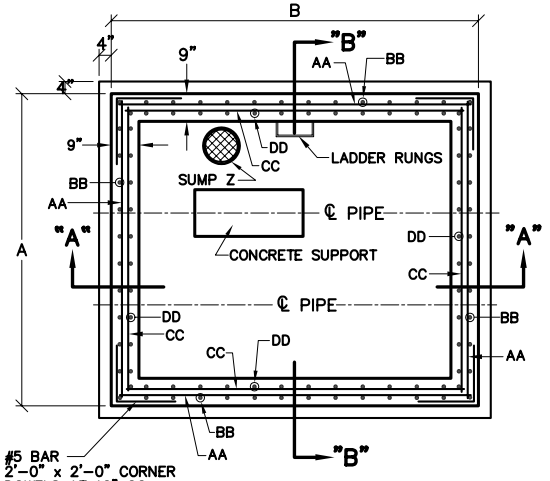


ROOF SLAB

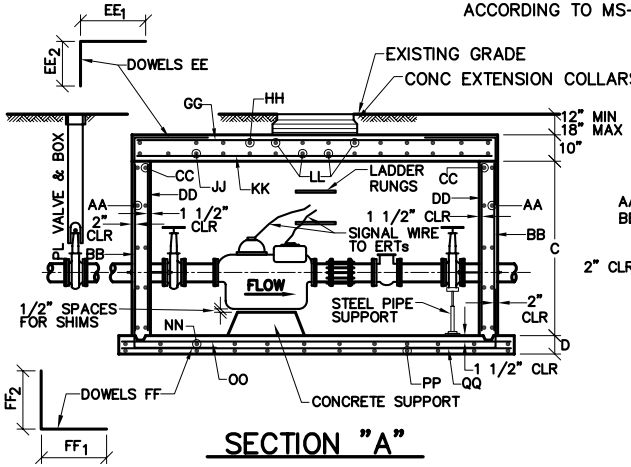
NOTE:
THE ROOF SLAB MAY BE CAST IN SECTIONS AS LONG AS THE INDIVIDUAL SECTION WEIGHT DOES NOT EXCEED 7,500 POUNDS ACCORDING TO MS-26.



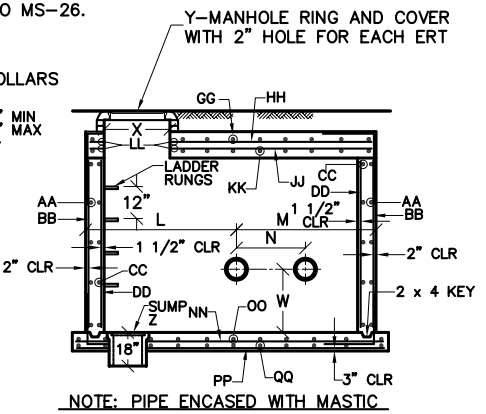
FLOOR SLAB



PLAN OF VAULT



SECTION "A"



NOTE: PIPE ENCASED WITH MASTIC

SECTION "B"

SEE SHEET NO. 59 FOR DIMENSIONS CORRESPONDING TO THIS DRAWING.

NOTE:
EACH METER REQUIRES AN ELECTRONIC DIGITAL ENCODER OR MECHANICALLY ENCODED REGISTER WITH AN ITRON ERT FOR EACH REGISTER EXCEPT FOR MASTER METER DISTRIBUTORS. DENVER WATER WILL DETERMINE TYPE OF ERT AND LOCATION PRIOR TO VAULT INSTALLATION.

NOTE:
THE DISTANCE BETWEEN RUNGS, CLEATS AND STEPS SHALL NOT EXCEED 12 INCHES AND SHALL BE UNIFORM THROUGHOUT THE LENGTH OF THE LADDER.

DENVER WATER
1600 West 12th Avenue, Denver, Colorado 80204
Phone(303)628-6000 Telecopier No.(303)628-6851

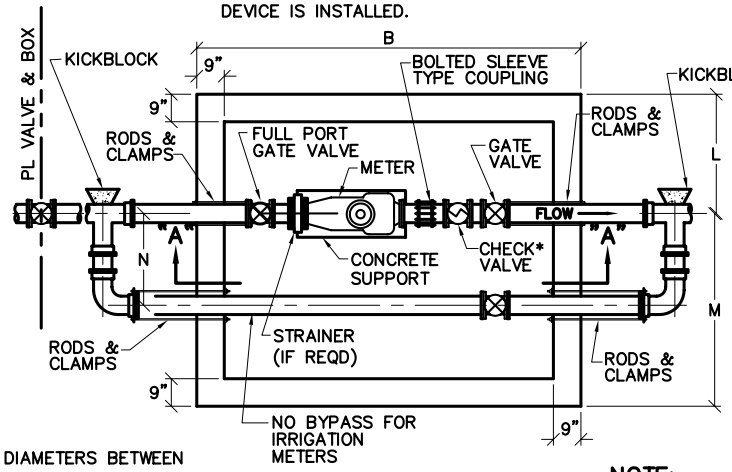
COMPACT FIRELINE METER WITH BYPASS

Scale: NONE Date: AUGUST 1995
Drawn: C.B.B. Tr: Ck:
Approved: Dr. 127 No. 35

SHEET 62

REVISED 2004

* CHECK VALVES ARE NOT REQUIRED WHERE A BACKFLOW PREVENTION DEVICE IS INSTALLED.

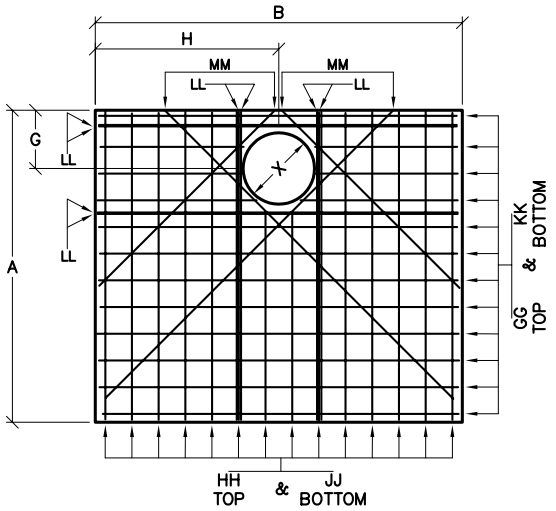


NOTE:
MIN 5 PIPE DIAMETERS BETWEEN METER AND VALVES. (BOTH SIDES)

PLAN OF PIPING

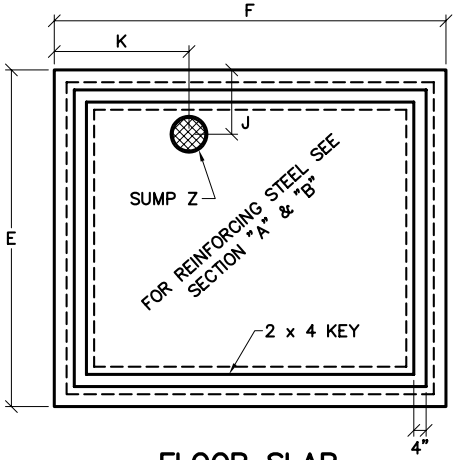
NOTE:
1" MASTIC TYP @ ALL RODS THRU WALLS.

LL= TOP OR BOTTOM MM= BOTTOM ONLY

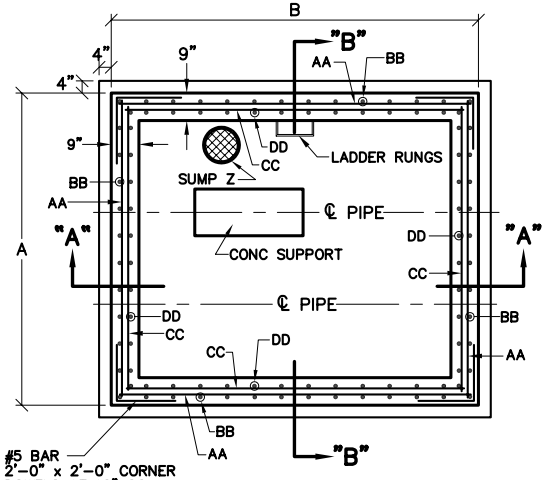


ROOF SLAB

NOTE:
THE ROOF SLAB MAY BE CAST IN SECTIONS FOR FUTURE ACCESS. THE SECTIONS SHALL BE CAST SUCH THAT THE INDIVIDUAL SECTION WEIGHT DOES NOT EXCEED 7,500 POUNDS ACCORDING TO MS-26.

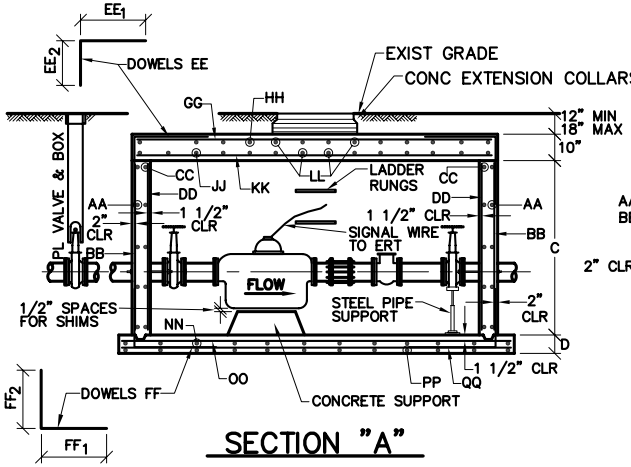


FLOOR SLAB

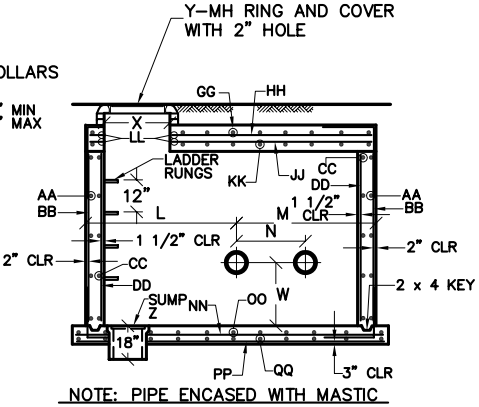


PLAN OF VAULT

*SEE 6.18 AND MS-25



SECTION "A"



NOTE: PIPE ENCASED WITH MASTIC

SECTION "B"

NOTE:
EACH METER REQUIRES AN ELECTRONIC DIGITAL ENCODER OR MECHANICALLY ENCODED REGISTER WITH AN ITRON ERT EXCEPT FOR MASTER METER DISTRIBUTORS. DENVER WATER WILL DETERMINE TYPE OF ERT AND LOCATION PRIOR TO VAULT INSTALLATION.

NOTE:
THE DISTANCE BETWEEN RUNGS, CLEATS AND STEPS SHALL NOT EXCEED 12 INCHES AND SHALL BE UNIFORM THROUGHOUT THE LENGTH OF THE LADDER.

TURBINE METER

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628-6000 · Telecopier No.(303)628-6851

Scale: NONE Date: AUGUST 1995

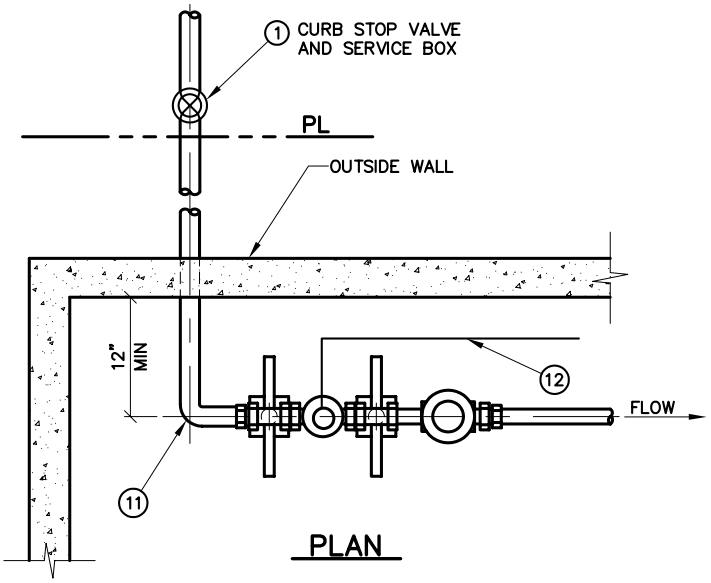
Drawn: C.B.B. Tr: Ck:

Approved: Dr. 127 No. 35

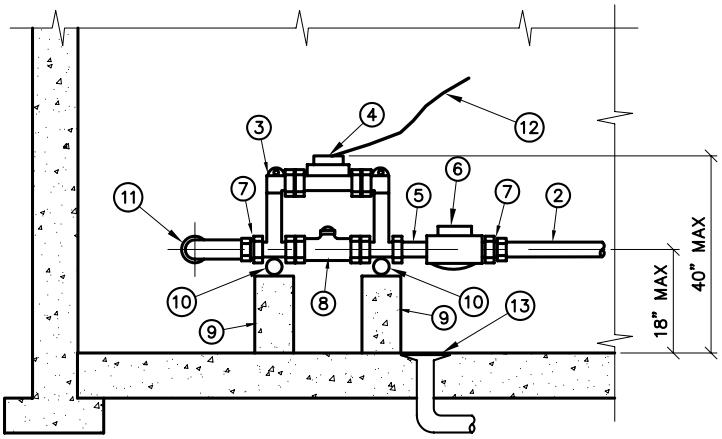
62

SHEET 74

Notes



PLAN



ELEVATION

NOTES:

1. PIPE JOINT SHALL BE THRD OR SOLDERED WITH 95–5 TIN/ANTIMONY SOLDER.
2. INSTALLATION MUST ALLOW FOR FULL ACCESS TO METER AND VALVES, AND PROVIDE PROTECTION FROM FREEZING.
3. SEE SHEET 45 FOR ADDITIONAL NOTES.
4. A FLOOR DRAIN SHALL BE PLACED NEAR THE METER INSTALLATION.
5. METER SUPPORT MAY BE EITHER CONC OR UNISTRUT ATTACHED TO WALL.
6. ALL METERS MUST BE FURNISHED WITH AND ELECTRONIC DIGITAL ENCODER REGISTER OR MECHANICALLY ENCODED REGISTER, AND WITH AN ITRON REMOTE ERT.
7. ERT WILL BE INSTALLED AT A LOCATION DETERMINED BY DENVER WATER AT TIME OF METER INSPECTION. IN MOST CASES, ERT WILL BE INSTALLED ON THE OUTSIDE OF THE BUILDING FACING A PUBLIC STREET. IF ERT IS MORE THAN 20 FT FROM METER LOCATION, OWNER MUST PROVIDE CONDUIT AND SIGNAL WIRE FROM METER TO ERT LOCATION. (SEE SHEET 53 FOR DETAIL OF CONDUIT AND OUTSIDE ERT MOUNTING).
8. INSIDE METER SETTINGS ARE PERMITTED ONLY WHEN THE TOTAL LENGTH OF SERVICE PIPE FROM MAIN TO METER SETTING DOES NOT EXCEED 60 FT.
9. BYPASS NOT PERMITTED ON IRRIGATION SERVICES.

DETAILS:

1. CURB STOP
2. TYPE K COPPER TUBING
3. 12" COPPERSETTER / METER YOKE
4. METER UNIT
5. 3" NIPPLE BETWEEN COPPERSETTER AND CHECK VALVE
6. CHECK VALVE
7. IRON PIPE TO FLARE COUPLING FROM INLET SIDE OF COPPERSETTER AND OUTLET SIDE OF CHECK VALVE
8. BY–PASS WILL BE 1" FOR 1 1/2" COPPERSETTERS AND 1 1/2" OR 1 1/4" FOR 2" COPPERSETTERS
9. CONC BLOCK SUPPORTS 4"x 4"x 12"
10. 1"x 18" PIPE
11. 90° ELL
12. SIGNAL WIRE TO ITRON ERT
13. FLOOR DRAIN

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628–6000 · Telecopier No.(303)628–6851

INSIDE SETTING FOR 1 1/2" & 2" METER WITH CHECK VALVE & BYPASS

Scale: NONE	Date: NOVEMBER 1995	
Drawn: RVM	Tr:	Ck:
Approved:	Dr. 127	No. 35

NOTES:

1. PIPING FOR 3" AND LARGER METERS SHALL BE DI.
2. INSTALLATION MUST ALLOW FOR FULL ACCESS TO METER AND VALVES, AND PROVIDE PROTECTION FROM FREEZING, WITH MIN 2 FT CLEARANCE TO WALL.
3. MIN DISTANCE FROM METER TO BYPASS LINE IS 2'-6"
4. A FLOOR DRAIN WITHIN 10 FT OF THE METER INSTALLATION IS REQD.
5. ALL VALVES TO BE NON-RISING STEM, RH OPEN.
6. A CHECK VALVE IS REQD IN ALL INSTALLATIONS UNLESS A BACKFLOW PREVENTION DEVICE IS INSTALLED.
7. ALL METERS MUST BE FURNISHED WITH ELECTRONIC DIGITAL ENCODER REGISTERS OR MECHANICALLY ENCODED REGISTERS, AND WITH AN ITRON REMOTE ERT FOR EACH REGISTER.
8. ERTS WILL BE INSTALLED AT A LOCATION DETERMINED BY DENVER WATER AT TIME OF METER INSPECTION. IN MOST CASES, ERTS WILL BE INSTALLED ON THE OUTSIDE OF THE BUILDING FACING A PUBLIC STREET. IF ERTS ARE MORE THAN 20 FT FROM METER LOCATION, OWNER MUST PROVIDE CONDUIT AND SIGNAL WIRE FROM METER TO ERT LOCATION. (SEE SHEET 53 FOR DETAIL OF CONDUIT AND OUTSIDE ERT MOUNTING).
9. INSIDE METER SETTINGS ARE PERMITTED ONLY WHEN THE TOTAL LENGTH OF SERVICE PIPE FROM MAIN TO METER SETTING DOES NOT EXCEED 60 FT.
10. ALL FITTINGS ARE TO BE FLANGED.

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628-6000 · Telecopier No.(303)628-6851

INSIDE SETTING FOR 3" AND LARGER COMPOUND METER

Scale: NONE	Date: DECEMBER 1998	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

REVISED 2004

Notes

Conversions From A Second Source To Treated Water Service

Customers with a second source of water on their property that wish to acquire treated water service follow the same procedures, rules, and pay the same fees as a customer applying for a treated water tap. An approved Denver Water backflow prevention device must be installed on the treated water service line and inspected before water can be used through the new tap and service line. The backflow preventer device must be tested annually and a copy of the positive test results sent to Denver Water's Backflow Prevention Officer.

When you pick up a Water Supply License from Sales Administration or from the Distributor, ask for a Dual Water Supply Agreement. This Agreement must be completed and signed by the property owner and will be processed with the License.

A Denver Water approved backflow preventer device must be installed and tested on all service lines for new taps within Denver Water's system if there is a second source of water on the property. Water from a second source can be used for irrigation, but cannot be commingled with Denver Water's treated water. Contact Denver Water's Backflow Prevention Office at 303-628-5979 for additional information.

When requesting a ¾-inch or 1-inch meter set (303-628-6145) or 1-½-inch or larger meter inspection (303-628-6706), please mention that the address also has a second source of water on the property. A field representative will set or inspect the meter, install the AMR device and verify that the backflow preventer device has been installed and tested by a state certified backflow inspector. A copy of the backflow preventer device inspection must be on site at the time the meter is set. The Quality Control Lab (303-628-5973) will verify that a backflow prevention device has been installed.

If the tap is in a Master Meter Distributor area, please contact our Quality Control Lab at 303-628-5973 to witness the disconnection and verify that the backflow prevention device has been installed.

Contact the State Engineer's office at 303-866-3587 for information about ground water wells.

Hydrant Permits

Please contact Sales Administration Monday-Friday between 8:00 a.m. and 4:00 p.m. at 303-628-6100 for additional information about requirements and fees

Fees and penalties are assessed for unauthorized hydrant use.

General Information

- Permits will **not** be issued for activities or uses that waste water (mud volleyball, or washing sidewalks, buildings, parking lots, equipment, streets, filling private swimming pools, ponds, lakes, etc.). Unmetered hydrant use for construction or demolition activities is not allowed.

- Read and Bill areas served by Denver Water require a hydrant permit from the Distributor and Denver Water (contact Sales Administration at 303-628-6100 for details).

- Master Meter Distributors maintain their own hydrant permit programs.

- A Denver Water approved 3-inch hydrant meter must be purchased from a vendor and brought to the Denver Water Meter Shop to be numbered and calibrated. Denver Water does not sell or supply hydrant meters or RPZ backflow preventers. The meter must be tested prior to the assigned "start" permit date and after the permit has expired. The maximum length of a hydrant permit using a 3-inch meter is one (1) year. The meter must be brought to Denver Water annually for calibration. All fees will need to be paid before a new permit is issued.

1. A hydrant permit must be issued by Denver Water to use a hydrant for any purpose other than extinguishing fires. Hydrant permits are valid only on the dates specified on the permit. Use of an expired hydrant permit will result in an unauthorized hydrant use violation.

2. The applicant must have the original hydrant permit at the site where the hydrant is being used. If the permit is not on site, a violation will be issued.

3. Normally, only the applicant whose name appears on the permit is authorized to use water from the hydrant. Sub-contractors are allowed to use hydrants under a general contractor's hydrant permit, provided a letter is submitted to Denver Water authorizing the sub-contractor to use permit holders meter. A Denver Water approved meter and backflow prevention device must be used on the hydrant at all times. Failure to meet these requirements will result in an unauthorized hydrant use violation.

4. Denver Water employees are authorized to examine the permit, meter and backflow prevention device at any time.

5. A permit may be canceled by Denver Water for any cause without prior notice to the applicant.

6. Charges for water used through hydrants are either computed based on the number of days used and the size of adapter, or by the meter reading. Hydrant use and charges are determined by Denver Water. Tank trucks must have a current Air Gap Certification on file in Sales Administration. Meters with approved RPZ backflow preventers must have a current Backflow Preventer Certification on file in Sales Administration. Permits for metered use require the applicant to provide the following information to Denver Water's Sales Administration Section each month:

- The location of the hydrant being used
- Beginning and ending dates of hydrant use
- Meter readings

7. All connections to a hydrant must be removed when the hydrant is unattended. A hose or fitting of any kind found connected to a hydrant, left unattended, could be removed and confiscated by Denver Water, and a violation will be issued. If Denver Water personnel confiscates the equipment, a note will be left on the hydrant.

8. Only a Denver Water approved fire hydrant wrench and adapter can be used.

9. If the adapter must be replaced, the cost will be assessed to the applicant whose name appears on the permit.

10. Fire hydrant use will not increase any liability of the City and County of Denver or the Board of Water Commissioners.

11. Damage to the fire hydrant will be the responsibility of the applicant to whom the permit was granted.

12. Unauthorized fire hydrant use will incur unauthorized use fees and may result in permit revocation, denial of future permits, and other legal remedies available pursuant to state law and/or municipal ordinance.

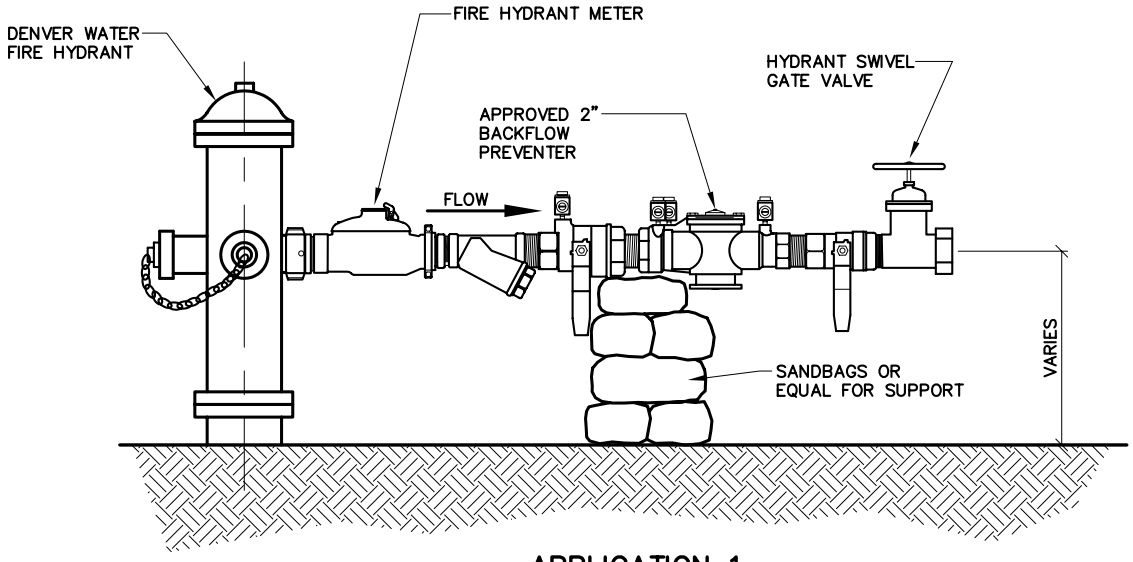
13. Meter attached to hydrant must be within eye-sight of company at all times. Failure to comply will result in confiscation of meter by Denver Water.

14. Hydrant use violation fines are assessed as follows:

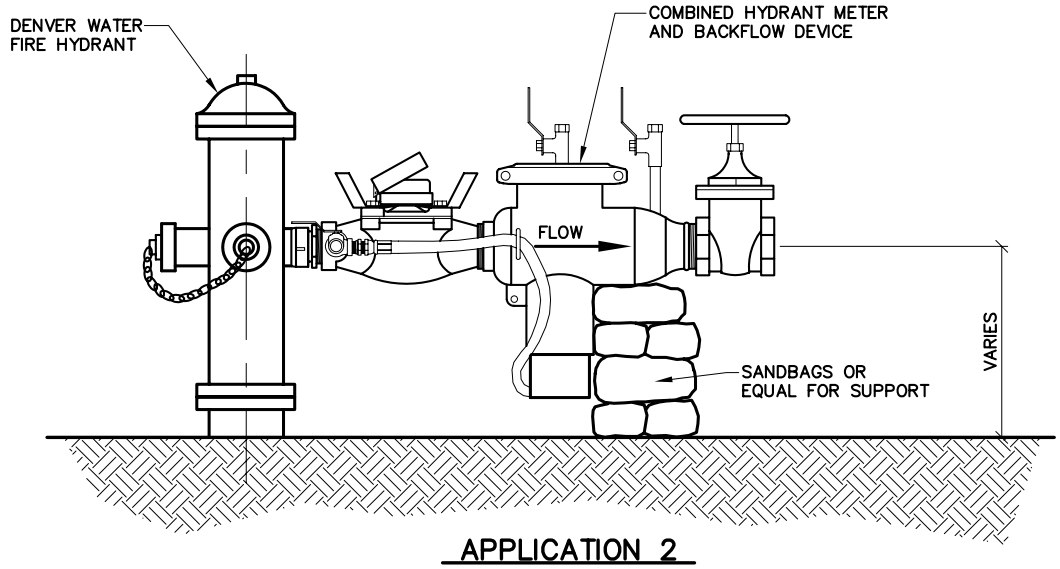
    - 1st violation: $250.00
    - 2nd violation: $500.00
    - 3rd violation: $750.00
    - 4th violation: $1,000.00

    Subsequent violations may result in loss of all hydrant use privileges. Additional unauthorized use of hydrants, after loss of privileges, may result in criminal and/or civil charges.

Call Sales Administration at 303-628-6100 for additional information about hydrant permits.



APPLICATION 1



APPLICATION 2

NOTES:

1. USE OF HYDRANT REQUIRES VALID HYDRANT USE PERMIT. CONTACT DENVER WATER SALES OFFICE FOR APPLICATION.
2. METER AND RPZ BACKFLOW DEVICE SHALL BE FULLY SUPPORTED WHEN CONNECTED TO FIRE HYDRANT.
3. METER AND RPZ BACKFLOW DEVICE SHALL BE APPROVED BY DENVER WATER. (MS-30) METER MUST BE INSPECTED AND NUMBERED BY DENVER WATER BEFORE BEING PLACED IN SERVICE.
4. METER SHALL BE TESTED ANNUALLY BY DENVER WATER.
5. BACKFLOW DEVICE SHALL BE TESTED ANNUALLY AND COPY OF TEST SHALL BE SENT TO DENVER WATER, BEFORE USAGE WILL BE ALLOWED.
6. CONTRACTOR WILL BE HELD RESPONSIBLE FOR ANY DAMAGE TO FIRE HYDRANT DURING USE.

DENVER WATER
1600 West 12th Avenue · Denver, Colorado 80204
Phone(303)628-6000 · Telecopier No.(303)628-6851

STANDARD DESIGN FOR HYDRANT METER INSTALLATION

Scale: NONE	Date: DECEMBER 1999	
Drawn: C.B.B.	Tr:	Ck:
Approved:	Dr. 127	No. 35

¾” And 3” Hydrant Adapter Use Instructions

1. Remove one of the caps from the hydrant.

2. Thread the adapter tightly onto the 3-inch hydrant nozzle.

3. Tighten the remaining two caps.

4. Close the valve on the adapter.

5. Locate the operating nut on the top of the hydrant. Using only a standard hydrant wrench, turn the operating nut and open the fire hydrant slowly all the way until the hydrant wrench stops.

6. Close the hydrant at the operating nut two complete turns.

7. Open the valve on the adapter slowly, allowing any air trapped in the hydrant to escape.

8. Use the valve on the adapter and not the hydrant operating nut, to control the flow of water.

9. When finished with the hydrant:

    - Close the valve on the adapter
    - Close the fire hydrant at the operating nut
    - Remove any hose or fitting from the adapter
    - Open the valve on the adapter to release any air trapped in the hydrant

10. Remove the adapter and replace the hydrant cap.

Notes

Recycled Water Project

Since 1989, Denver Water has investigated creating a recycled water system to serve the northeast service area. The proposed project would take wastewater from the Metro Wastewater Reclamation Facility and treat it to a level suitable for irrigation and industrial uses. Areas using this water will require separate pipes (dual distribution system) for potable (drinking) and recycled water.

The best time to build a dual distribution system is when an area is first being developed. It is difficult to install nonpotable water mains and service lines in an established area because of the costs to cut streets and retrofit existing water services. For the recycled water project, new growth areas present an excellent opportunity for a dual distribution system. Lowry Redevelopment, Denver International Airport (DIA), Stapleton Redevelopment and Gateway, along with the City Ditch Corridor, are major areas identified for potential recycled water taps.

Tap fees and water rates will be cheaper if your tap is made on a recycled water main.

Recycled water service is scheduled to begin in late 2003. The following guidelines provide information for users needing water service in the recycled service area that will be supplied with recycled water in the future.

Tap Application

If you have been identified as a customer in the recycled service area or are requesting recycled water service, Denver Water will determine if you are eligible. Irrigation taps for single family homes do not qualify for recycled water. Determining eligibility factors include anticipated water consumption, type of use (such as irrigation and cooling), and distance from a recycled transmission main. Denver Water reserves the right to require the use of recycled water when appropriate.

The Water Supply License (tap application) for a tap onto a recycled water main is purple, as are the mains (when installed), meters and service lines. These Licenses are processed by Sales Administration like other Licenses; however, different approval criteria and fees will apply.

All recycled water taps must be installed separately from potable water taps. Recycled water customers will receive potable water or another suitable source until the recycled system is operational in the area. At that time the connections will be converted to the recycled water system at no charge, **if** the facilities for recycled water service have been installed**.**

Main Extensions and Service Design

Recycled water mains carry water from large recycled transmission pipes. The water pressure of the recycled system will be lower than the pressure in the potable water system. Irrigation systems using recycled water should be designed according to the pressure. Please contact Sales Administration at 303-628-6100 for information about installing recycled water mains.

Safety Issues

If you become a recycled water user, you will be required to incorporate the following safety requirements:

- All recycled water mains must be purple and labeled with the statement "Recycled Water Pipe."

- All recycled service lines must be purple. All meters for recycled taps will be painted purple when the system comes on line.

- Meters that monitor consumption from raw water sources are different from those used in potable or reuse water situations. Contact Denver Water's Meter Shop at 303-628-6701 for information about these meters.

- All fixtures exposed to the public, such as irrigation systems, must have signs stating "Recycled Water – Do Not Drink."

All other design criteria can be found in Chapter 11 of the Denver Water *Engineering Standards* and Chapter 18 of the Operating Rules.

Please contact Sales Administration at 303-628-6100 for additional information.

Irrigation Systems And Water Features

General Information

Connections for irrigation systems for single family homes can be made to the service line no closer than 5 feet on the downstream side (house side) of the meter. Remember to contact the appropriate building department to obtain necessary permits. All irrigation systems and water features require a backflow prevention assembly, which must be tested by a State Certified Technician and inspected by Denver Water.

Irrigation taps for single-family homes will not be eligible to receive recycled water. Larger irrigation tracts, cooling systems, and other uses may qualify for a tap for recycled water. If your property is within the area bounded by Downing Street/DIA and East Florida Avenue/East 58th Avenue, you may be eligible to receive a recycled tap.

Recycled water will be available in the northeast Denver area after 2003. Many recycled mains have already been installed. Tap fees and water consumption rates will be cheaper if your tap is made to a recycled main. Call Sales Administration (303-628-6100) for additional information about recycled water sources throughout our service area. Please see the Recycled Water Section of this booklet for additional information.

Spray Irrigation of Narrow Grass Strips

As of May, 2003, irrigation of medians and other public landscaped areas less than 25 feet wide must be done in accordance with Denver Water Operating Rule 12.07:

a. For strips of land less than 6 feet wide, spray irrigation shall be prohibited. Low-flow irrigation systems are required.

b. For strips of land between 6 feet wide and 15 feet wide, only low-flow irrigation or spray irrigation using low-angle spray nozzles designed for the specific width to be irrigated shall be permitted. All spray heads must be pressure reducing and designed to prevent low head drainage.

c. For strips of land more than 15 feet wide, only gear-driven rotors with low-angel nozzles may be used to irrigate turf areas. Planting beds may be irrigated with low-flow or spray irrigation. All spray heads must be pressure reducing and designed to prevent low head drainage.

Plan Review Required

Water features and irrigation taps for large parcels of land (5 acres or more) require a special review and approval by the Board of Water Commissioners before a Water Supply License can be issued. If the parcel to be irrigated is 5 or more acres, an alternate source of recycled water will be explored before a License is processed. The Board has the authority to deny the request for a tap.

A complete set of irrigation and planting plans, as well as a water budget, must be submitted to Sales Administration for review and approval if your tap:

- Will serve 5 or more acres
- Involves Denver City property
- Is within a recycled water area
- Has street crossing/sleeves

Plant crop coefficients referenced on the water budget will vary due to site orientation and natural precipitation. Match proposed plant material with the closest plant category representing its water needs. For each proposed tap, identify:

- The number of irrigated acres
- Plant category
- Operating time parameters

Water budget information is available via E-mail or diskette. Contact Conservation at 303-628-6329 for details.

A special review and approval may also be required for decorative water features (fountains, ponds, lakes, and streams) if the surface area is 1.5 acres or more, or if the annual water use will be 1,000,000 gallons or more.

Decorative outdoor fountains using potable water must recycle water within the fountains. Fountains that are automatically filled with water must have an approved backflow prevention device.

Checklist of Information Required for Irrigation Review

☐ Site Plan (Drawing)

☐ Total Project Acres (Present and future phases)

☐ Total Irrigated Acres (Present and future phases)

☐ Completed Water Budget

☐ Estimated Annual Consumption, Gallons and/or Acre-Feet (See Water Budget on Page 71)
Per Individual Tap if Multiple Taps Involved
Show Calculations Summary for Verification

☐ Grading/Drainage (Drawing)

☐ Irrigation Plan (Drawing)

☐ Irrigation Details (Drawing)

☐ Planting Plan (Drawing)

☐ Planting Detail (Drawing)

☐ Irrigation Specification (Document)

☐ Planting Specification (Document)

☐ Estimated Peak Flow Rate, (Gallon Per Minute)
Per Individual Tap if Multiple Taps Involved
Show Calculations Summary for Verification

☐ Meter and Tap Size
Per Individual Tap if Multiple Taps Involved

☐ Location of Backflow Prevention Device

☐ Location of Meter and AMR Device

☐ Expected/Design Pressure, PSI
Per Individual Tap if Multiple Taps Involved

Information Required for Water Feature Review

☐ Total Surface Area

☐ Show Use of Recirculation Pump (Fill and makeup water only)

☐ Show Backflow Prevention

☐ Tap Size, Location and Size and Location of Main to be Tapped

Notes

WATER BUDGET

PROJECT NAME:						SUBMITTED BY:			DATE:
DESCRIPTION	**IRRIGATED ACRES**	**MONTH**	**HISTORICAL ET**	**PLANT COEFFICIENT**	**PLANT WATER REQUIREMENT**	**SYSTEM EFFICIENCY (%)**	**TOTAL WATER REQUIREMENTS (IN.)**	**WEEKLY WATER REQUIREMENTS (IN.)**	**MONTHLY WATER REQUIREMENTS (GAL.)**
PLANT TYPE:	?	APRIL	1.8	0.9	1.62	100%	1.62	#VALUE!	#VALUE!
BLUEGRASS		MAY	5.2	0.9	4.68	100%	4.68	#VALUE!	#VALUE!
(High Usage)		JUNE	6.6	0.9	5.94	100%	5.94	#VALUE!	#VALUE!
		JULY	7.1	0.9	6.39	100%	6.39	#VALUE!	#VALUE!
		AUGUST	6.2	0.9	5.58	100%	5.58	#VALUE!	#VALUE!
		SEPTEMBER	4.5	0.9	4.05	100%	4.05	#VALUE!	#VALUE!
		OCTOBER	1.4	0.9	1.26	100%	1.26	#VALUE!	#VALUE!
OPERATING PERIOD-HRS./DAY	?					TOTAL	29.52	TOTAL	#VALUE!
DAYS/WEEK	?							ACRE FEET/YR.	#VALUE!
DAYS/MONTH	?							PEAK SEASON GPM	#VALUE!
DESCRIPTION	**IRRIGATED ACRES**	**MONTH**	**HISTORICAL ET**	**PLANT COEFFICIENT**	**PLANT WATER REQUIREMENT**	**SYSTEM EFFICIENCY (%)**	**TOTAL WATER REQUIREMENTS (IN.)**	**WEEKLY WATER REQUIREMENTS (IN.)**	**MONTHLY WATER REQUIREMENTS (GAL.)**
PLANT TYPE:	?	APRIL	1.8	0.8	1.44	100%	1.44	#VALUE!	#VALUE!
FESCUE		MAY	5.2	0.8	4.16	100%	4.16	#VALUE!	#VALUE!
		JUNE	6.6	0.8	5.28	100%	5.28	#VALUE!	#VALUE!
		JULY	7.1	0.8	5.68	100%	5.68	#VALUE!	#VALUE!
		AUGUST	6.2	0.8	4.96	100%	4.96	#VALUE!	#VALUE!
		SEPTEMBER	4.5	0.8	3.60	100%	3.60	#VALUE!	#VALUE!
		OCTOBER	1.4	0.8	1.12	100%	1.12	#VALUE!	#VALUE!
OPERATING PERIOD-HRS./DAY	?					TOTAL	26.24	TOTAL	#VALUE!
DAYS/WEEK	?							ACRE FEET/YR.	#VALUE!
DAYS/MONTH	?							PEAK SEASON GPM	#VALUE!
DESCRIPTION	**IRRIGATED ACRES**	**MONTH**	**HISTORICAL ET**	**PLANT COEFFICIENT**	**PLANT WATER REQUIREMENT**	**SYSTEM EFFICIENCY (%)**	**TOTAL WATER REQUIREMENTS (IN.)**	**WEEKLY WATER REQUIREMENTS (IN.)**	**MONTHLY WATER REQUIREMENTS (GAL.)**
PLANT TYPE:	?	APRIL	1.8	0.5	0.90	100%	0.90	#VALUE!	#VALUE!
SHRUBS		MAY	5.2	0.5	2.60	100%	2.60	#VALUE!	#VALUE!
(Moderate Usage)		JUNE	6.6	0.5	3.30	100%	3.30	#VALUE!	#VALUE!
		JULY	7.1	0.5	3.55	100%	3.55	#VALUE!	#VALUE!
		AUGUST	6.2	0.5	3.10	100%	3.10	#VALUE!	#VALUE!
		SEPTEMBER	4.5	0.5	2.25	100%	2.25	#VALUE!	#VALUE!
		OCTOBER	1.4	0.5	0.70	100%	0.70	#VALUE!	#VALUE!
OPERATING PERIOD-HRS./DAY	?					TOTAL	16.40	TOTAL	#VALUE!
DAYS/WEEK	?							ACRE FEET/YR.	#VALUE!
DAYS/MONTH	?							PEAK SEASON GPM	#VALUE!
DESCRIPTION	**IRRIGATED ACRES**	**MONTH**	**HISTORICAL ET**	**PLANT COEFFICIENT**	**PLANT WATER REQUIREMENT**	**SYSTEM EFFICIENCY (%)**	**TOTAL WATER REQUIREMENTS (IN.)**	**WEEKLY WATER REQUIREMENTS (IN.)**	**MONTHLY WATER REQUIREMENTS (GAL.)**
PLANT TYPE:	?	APRIL	1.8	0.3	0.54	100%	0.54	#VALUE!	#VALUE!
NATIVE PLANT MATERIAL		MAY	5.2	0.3	1.56	100%	1.56	#VALUE!	#VALUE!
(Low Usage)		JUNE	6.6	0.3	1.98	100%	1.98	#VALUE!	#VALUE!
		JULY	7.1	0.3	2.13	100%	2.13	#VALUE!	#VALUE!
		AUGUST	6.2	0.3	1.86	100%	1.86	#VALUE!	#VALUE!
		SEPTEMBER	4.5	0.3	1.35	100%	1.35	#VALUE!	#VALUE!
		OCTOBER	1.4	0.3	0.42	100%	0.42	#VALUE!	#VALUE!
OPERATING PERIOD-HRS./DAY	?					TOTAL	9.84	TOTAL	#VALUE!
DAYS/WEEK	?							ACRE FEET/YR.	#VALUE!
DAYS/MONTH	?							PEAK SEASON GPM	#VALUE!

PROJECT TOTALS	
IRRIGATED ACRES	#VALUE!
GALLONS/YEAR	#VALUE!
ACRE FEET/YEAR	#VALUE!
PEAK SEASON GPM	#VALUE!

DENVER WATER
REVIEWED BY:
DATE:

NOTE:

Plant water requirements are determined utilizing 100% system efficiencies.
Actual system efficiencies are specific to each systems design, operating pressure and will increase application rates.
Approximate values:
Drip irrigation - 95%
Rotor irrigation - 85%
Spray head irrigation: 75%
April & October ET represent 2 week watering windows.

Backflow Prevention

Denver Water complies with the State of Colorado's Cross Connection Control Manual

Denver Water's Backflow Prevention Office (303-628-5979) can provide information about backflow prevention policy and approved devices or assemblies, as well as the names and phone numbers of State Certified Technicians who can test these devices.

An approved Denver Water backflow device must be installed on all treated water service lines when there is a second source of water on the property. **Noncompliance with this regulation will result in the termination of water service.** A double check valve assembly is not an approved backflow prevention device. Contact Denver Water's Backflow Prevention Office at 303-628-5979 for additional information. An approved Denver Water backflow prevention device must be installed on residential, commercial, industrial, institutional, and public facilities that use the public water supply. Because landscape irrigation systems are subject to cross-connections due to flooding, agricultural chemicals (such as fertilizers, pesticides, soil conditioners), and from submerged outlets, auxiliary water supplies, ponds, reservoirs, swimming pools, and other sources of stagnant, polluted or contaminated waters, these systems are considered to be actual, potentially high or severe hazard situations.

Backflow protection in the form of approved atmospheric and pressure vacuum breakers are approved for use in landscape irrigation systems, with the following exceptions:

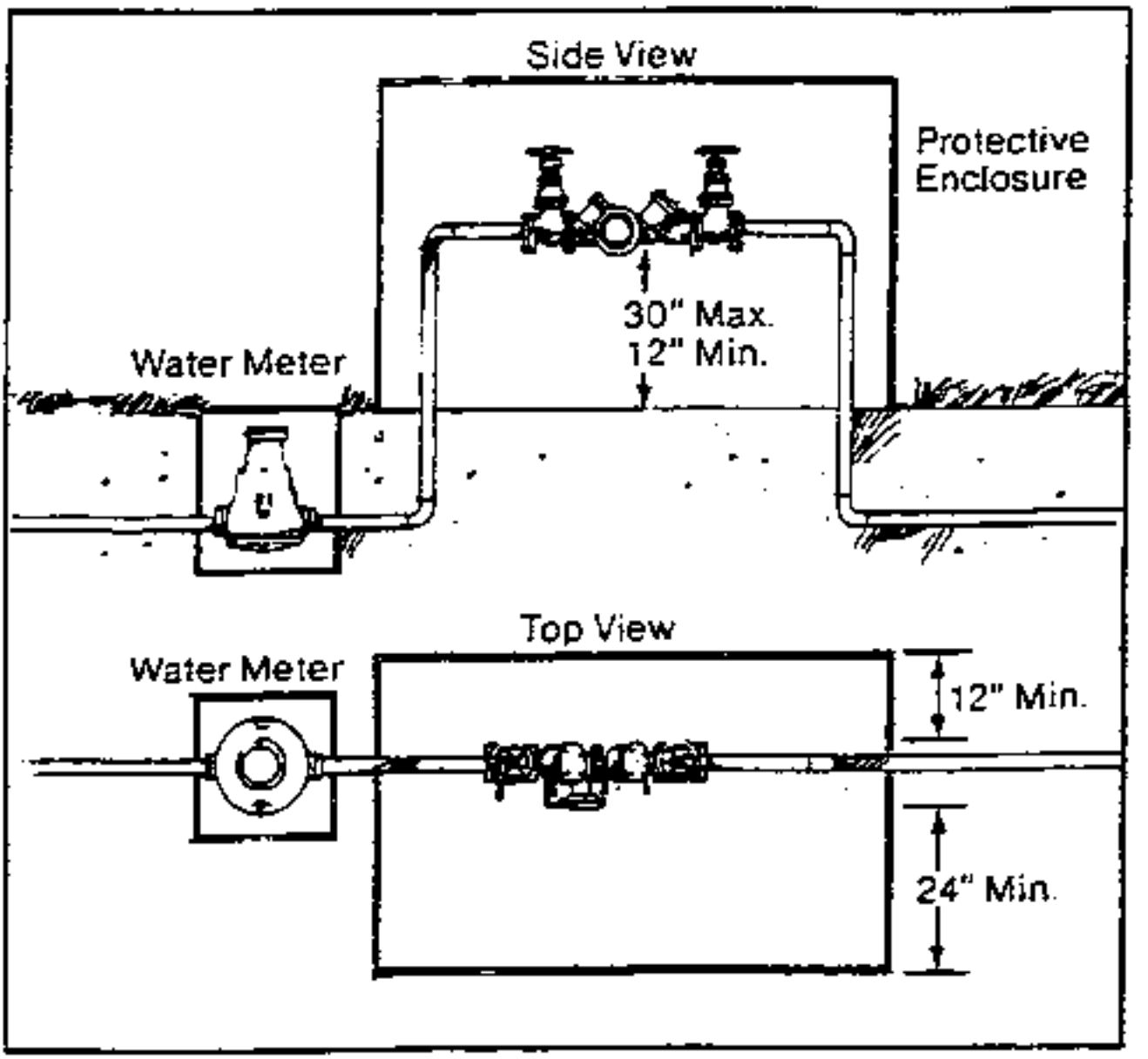
- Locations subject to flooding
- Systems which are subject to back pressure conditions
- Systems winterized by injection of compressed air
- Systems which inject fertilizers or other chemicals

With the exception of landscape irrigation systems, pressure vacuum breakers are not approved for cross-connection control by containment. Atmospheric vacuum breakers are not approved for cross-connection control by containment or whenever there is a control valve located downstream of the device.

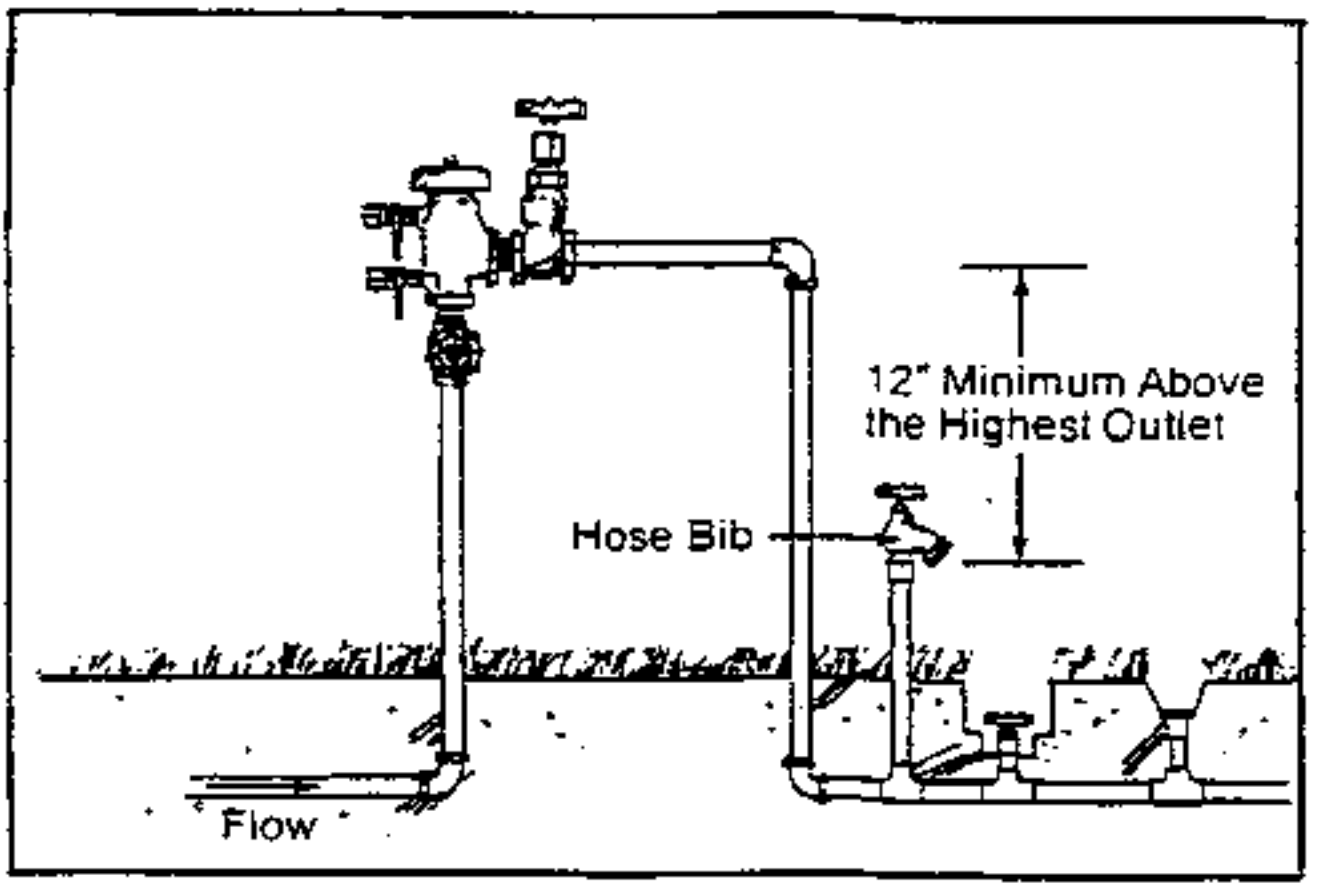
Air gap separations or reduced pressure principle backflow prevention assemblies are required for irrigation systems subject to the following conditions:

- Locations subject to flooding
- Systems which are subject to back pressure conditions
- Systems winterized by injection of compressed air
- Systems which inject fertilizers or other chemicals
- Premises that have auxiliary water sources available for irrigation

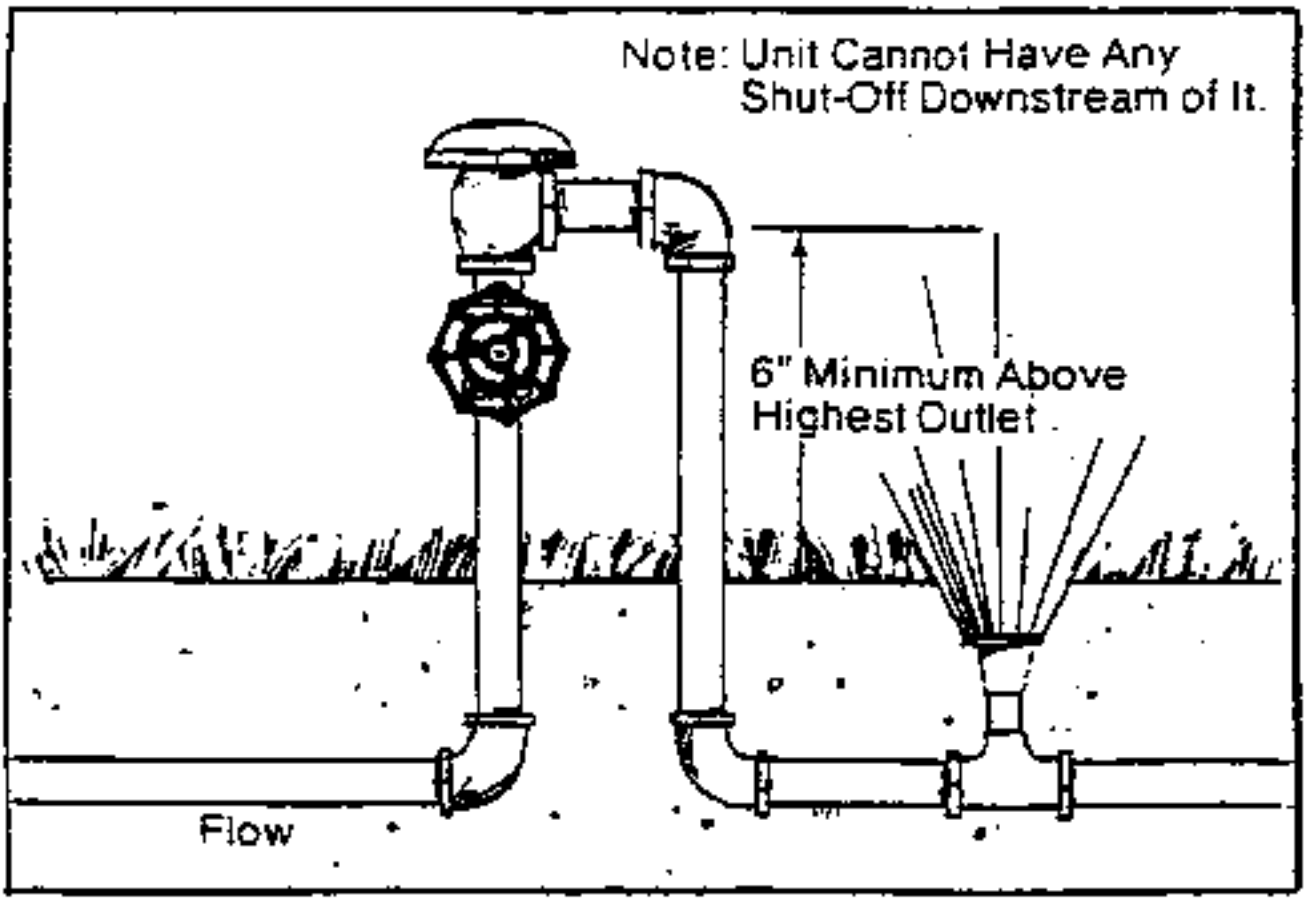
Reduced Pressure Device



Pressure Vacuum Breaker



Atmospheric Vacuum Breaker



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